# **APPENDIX A**

APRIL 13, 2010 EPA LETTER OF APPROVAL OF GEOSTATISTICAL EVALUATION AND GEOSTATISTICAL EVALUATION



# UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 6 1445 ROSS AVENUE, SUITE 1200 DALLAS, TX 75202-2733

APR 1 3 2011

RECEIVED

CERTIFIED MAIL- RETURN RECEIPT REQUESTED

ENVIRONMENTAL

Mr. Michael Peters CMC Americas Vice President, Environmental Manager 1 Steel Mill Dr. Seguin, TX 78155-7510

RE: Site Assessment Strategy Document for Polychlorinated Biphenyls (PCBs) Contamination at Commercial Metals Company Facility in Corpus Christi, Texas

Dear Mr. Peters:

We are in receipt of the technical justification for site assessment strategy document entitled, "Geostatistical Analysis" dated December 21, 2010, prepared and submitted by Weston Solutions, Inc. (Weston) on behalf of Commercial Metals Company (CMC), Corpus Christi Recycling Facility (CCRF), located at 4614 Agnes Street, Corpus Christi, Texas. This strategy document supplements your risk-based disposal approval application submitted pursuant to 40 C.F.R. § 761.61(c), and discussions during a conference call on September 20, 2010 between Weston, Texas Commission on Environmental Quality (TCEQ), United States Environmental Protection Agency (EPA) and you.

This strategy document was prepared to address EPA's concerns regarding soil sampling grids used to assess the lateral and vertical extent of PCB contaminated soil at the aforementioned CMC site. This strategy document has been approved as justification to accept the site characterization sampling done thus far both on-site and off-site pursuant to your 40 C.F.R. § 761.61(c) application. Since EPA is accepting your proposal to conduct the site characterization with over-sized sampling grids, any risk-based disposal approval issued per your application would require post verification sampling to be done pursuant to 40 C.F.R. §§ 761.280 – 761.298.

EPA is still awaiting a revised risk-based disposal approval application discussed during the September 20, 2010-conference call reflecting the change in operations at the CMC site. In accordance with 40 C.F.R. § 761.61(c)(2), without the following information, EPA cannot determine whether your application will not pose an unreasonable risk of injury to human health or the environment. Therefore, a revised complete application with the following information must be submitted within 45 calendar days of the date of this letter:

No Shredder Operation: If a shredder will not be used on-site, the following must be included in your revised application:

- 1. A detailed description of current and future operations or uses at this site;
- 2. A post-verification sampling plan for both on-site and off-site areas of contamination in accordance with 40 C.F.R. §§ 761.280 761.298;
- 3. Regulatory requirements for sampling and disposal of excavated media to include disposal decisions based on in-situ sampling; disposal site(s) information (name, address, contact information, authority to accept excavated media); and transporter information (name, address, contact information, EPA ID number);
- 4. Detailed information on any proposed cap(s) or other remedies at the site to include design, monitoring, recordkeeping, maintenance and all necessary long term institutional controls. In order to be protective of health and the environment at a minimum, your application should include a plan containing designs/controls to ensure that no precipitation can reach the underlying soils; controls/maintenance to ensure the entire cap is inspected at least once a calendar quarter, and all discrepancies (e.g., cracks/holes) documented and repairs completed within five working days of discovery;
- 5. Run-off/run-on controls for precipitation that comes into contact with scrap materials and shredder fluff;
- 6. A plan for controlling and collecting site run-off and associated sampling plan for PCBs, and any necessary disposal of such in accordance with 40 C.F.R. Part 761; and
- 7. The application should also include a community outreach plan. In addition, any proposed selected cleanup plan/remedy will be made available to the public during a 45 day public comment period announced by EPA during which requests may be made for a Public Hearing. If there is significant or substantial public comment, a Public Meeting may also be convened to take additional comments.

On-site Shredder Operation: If shredding is to continue at this location, your application must include the aforementioned information and the following additional information:

- 1. Wind dispersion controls on days and/or nights when shredder is operating in order that wind direction and velocity be recorded; and
- 2. A Source Control Plan that ensures that no regulated PCB materials are received or shredded at this facility that could be a new source of PCB contamination at this site.

You must also submit separately within 45 calendar days of receipt of this letter a "Temporary Measures Plan" that prevents any further off-site migration, and necessary

mitigation to prevent off-site PCB exposure (see 40 C.F.R. § 761.61). The plan should include, but is not limited to, appropriate engineering controls, fencing and signage.

Please be aware that in accordance with 40 C.F.R. § 761.50(3)(ii)(B) complete compliance with § 761.61 does not create a presumption against an enforcement action for penalties for unauthorized disposal. We look forward to receiving your revised § 761.61(c) application. After review of your revised application, EPA will determine if further information is needed. If you have questions or comments, please contact Mr. Jim Sales, of my staff, at (214) 665-6796.

Sincerely,

Susan Spalding

Associate Director for RCRA Multimedia Planning and

Permitting Division

cc:

Otu Ekpo Otu

Texas Commission on Environmental Quality

Robert Chapin

Weston Solutions, Inc.



### Weston Solutions, Inc. 2705 Bee Cave Road, Suite 100 Austin, Texas 78746 512-651-7100 • Fax 512-651-7101

21 December 2010

Mr. James Sales U. S. Environmental Protection Agency, Region 6 1445 Ross Avenue, Suite 1200 Mail Code 6ENHM Dallas, TX 75202-2733

RE: Commercial Metals Company
Corpus Christi Recycling Facility
4614 Agnes Street
Corpus Christi, Texas
Technical Justification for Site Assessment Strategy

Dear Mr. Sales:

During the conference call held on 20 September 2010 between the U. S. Environmental Protection Agency (USEPA), Commercial Metals Inc. (CMC), and Weston Solutions Inc. (WESTON<sub>®</sub>), you and Ms. Roberts requested more detailed justification for the soil sampling grid that has been used at the referenced site to assess the lateral and vertical extent of polychlorinated biphenyl (PCB)-impacted soil in accordance with 40 Code of Federal Regulations (CFR) §761.61(c) of PCB regulations. USEPA also requested more details regarding the preliminary design and the operations and maintenance plan of the proposed clay cap. In response to your first request, WESTON submits the attached technical justification for the site assessment strategy.

As you recall, the CMC site is currently enrolled in the Texas Commission on Environmental Quality (TCEQ) Voluntary Cleanup Program (VCP) to address other chemicals of concern (COCs). As part of the delineation of the extent of the COCs, WESTON also delineated the extent of PCBs at the facility. A sampling strategy was used that differed from the grid sampling intervals prescribed in Subpart N and Subpart O of 40 CFR §761. WESTON and CMC received approval of the alternate sampling strategy described below.

On-site areas were divided into four soil sampling areas: Shredder Area, Non-Shredder Area, Hot Spot Area, and the Maintenance Building Area. Off-site soil samples were also collected. Each area was assessed differently based on size, historical use, and expected use after remediation.

In general, strict sampling grid intervals detailed in Subpart N (§761.260-274) and Subpart O (§761.280-298) of the Toxic Substances Control Act (TSCA) were not appropriate, due to the large size of the property (18.4 acres) and the plan to cap the entire PCB-affected area. Use of these procedures is required when using the self-implementing remediation approach, but is not



specifically required when using a risk-based remediation approach. The large property area at the Corpus Christi facility made standard grid interval sampling impracticable. Instead, sample grid spacing common to environmental assessment activities was used. Many samples were also analyzed for non-PCB constituents in order to assess the lateral and vertical extents of these constituents in soil as required by the TCEQ VCP. Customary and routine sample spacing associated with VCP assessments was used and has been approved by the TCEQ.

As described in the attached report, geostatistical evaluation of the existing PCB soil data was used to demonstrate the applicability of geostatistical techniques for identification of overall data worth, data gaps, and optimal future sampling strategies. This report serves as an independent evaluation of existing Total PCBs soil data for the overall delineation of Site impacts.

As you are aware, USEPA was the first group to recognize that environmental data are often highly spatially dependent from the perspective of contaminant delineation. With this recognition, USEPA pioneered the use of geostatistics for environmental data and has developed, along with the American Society of Testing and Materials (ASTM), the guidance and standards utilized for geostatistical analyses for the investigation of environmental sites.

The geostatistical analysis of the CMC Site Total PCBs data set concludes that the existing data set is geostatistically robust and adequate for characterization of Total PCBs concentrations for the 0 to 1 ft and 0 to 5 ft intervals within the property boundary. The Total PCBs data are correlated, and concentrations can be estimated with a measurable level of statistical confidence between sample points that are no greater than 300 ft apart.

The geostatistical analysis did not specifically identify any true data gaps. However, one isolated area of data weakness was identified as shown in the figures in the report. Thus, only this area is recommended for potential supplemental sampling. While addressing this particular data weakness is not critical from the perspective of completing delineation within the Site boundary, additional concentration data within this area would provide greater resolution to support risk characterization for the Site.

The geostatistical analysis also addresses potential future horizontal delineation needs along the boundary perimeter. If further delineation is needed based on any exceedances of a Site Total PCB performance standard, the geostatistical analysis could be further utilized. This analysis was used to develop a prescribed optimal sampling strategy based on 150-ft spacing. The geostatistics demonstrated that sample spacing closer than 150-ft would provide redundant data, and alternatively spacing significantly greater than 150-ft would result in a potential data gap.

We respectfully request your concurrence with this technical justification and will contact you in early January to schedule a meeting to discuss it further (late January). In the meantime, WESTON is preparing a preliminary design and operations and maintenance plan for the proposed clay cap that will be constructed in order to close the northern portion of the facility.



Thank you for your consideration. Please email me at <u>robert.chapin@westonsolutions.com</u>, or call (512) 651-7113 for technical questions pertaining to this approach.

Sincerely,

WESTON SOLUTIONS, INC.

Robert Chapin, P.G. Client Service Manager

### Attachment(s)

cc: Otu Ekpo Otu, TCEQ

Randall Walker, CMC Americas Mike Peters, CMC Americas Mike Nasi, Jackson Walker, LLP John Woodyard, Weston Solutions, Inc. Kara Fields, Weston Solutions, Inc.

# Geostatistical Analysis Commercial Metals Company (CMC) Corpus Christi, Texas

**December 21, 2010** 

Prepared for:

**Weston Solutions, Inc.** 

Austin, Texas

Prepared by:



Two Midtown Plaza 1349 West Peachtree Street, Suite 2000 Atlanta, Georgia 30309

# **Table of Contents**

Execu	itive Summary	1
1.0	Introduction	3
1.1	Background	3
2.0	Scope of Analysis	4
2.1	Existing Data	4
2.2	Report Structure	4
3.0	Data Analysis Methodology	5
3.1	Geographical Information System	5
3.2	Statistical Methods	5
3.3	Geostatistical Methods	5
3.4	Methodology – Geostatistics	6
3.5	Variogram Analysis	8
3.6	Geostatistical Estimation	.13
3.7	Geostatistical Software	.14
3.8	Geostatistical Standards	.14
4.0	Data Compilation	.14
5.0	Exploratory Data Analysis	. 15
5.1	Spatial Distribution of Total PCBs	. 15
5.2	Probability Plots of Lead	. 16
6.0	Variogram Analysis of Total PCBs	. 17
6.1	Total PCBs – 0 to 1 ft Sample Interval	. 17
6.2	Total PCBs – 0 to 5 ft Sample Interval	.18
6.3	Total PCBs - > 5 ft Sample Interval	. 20
7.0	Geostatistical Estimation - Kriging	. 21
7.1	Total PCBs Kriging Results	.21
8.0	Proposed Supplemental Sampling Strategy	. 26
9.0	References	.28

CMC Site December 2010

### **TABLES**

Table 2.1 Total PCBs Summary Statistics

Table 5.3 - Geostatistical Data Summary Table

### **FIGURES**

Figure 5.2.1 – Total PCBs Sample Results – mg/kg

Figure 5.3.1-a - Probability Plot Total PCBs

Figure 5.3.1-b - Total PCBs Log-Transformed Data

Figure 6.1 – Total PCBS (0-1 ft) Spatial Distribution

Figure 6.1-a Total PCBs 0-1 ft Omni-Directional Variogram

Figure 6.1-b – Total PCBs 0-1 ft Anisotropy Check

Figure 6.2 – Total PCBS (0-5 ft) Spatial Distribution

Figure 6.2-a Total PCBs 0-5 ft Omni-Directional Variogram

Figure 6.2-b – Total PCBs 0-5 ft Anisotropy Check

Figure 6.3 – Total PCBS (>5 ft) Spatial Distribution

Figure 7.1.1a Total PCBs 0-1 ft Kriging Contour Map

Figure 7.1.1b Total PCBs 0-1 ft Kriging Estimation Variance Map

Figure 7.1.2a Total PCBs 0-5 ft Kriging Contour Map

Figure 7.1.2b Total PCBs 0-5 ft Kriging Estimation Variance Map

Figure 8.1 Horizontal Delineation Data Gaps (0-5 ft)

Figure 8.2 Horizontal Delineation Data Gaps (0-1 ft)

### **APPENDICES**

Appendix A – Geostatistical GIS Data Output



# **Executive Summary**

This report documents the results of the geostatistical analysis of existing total polychlorinated biphenyls (PCBs) soil data collected within and adjacent to the Commercial Metals Company (CMC) Facility in Corpus Christi, Texas (Site). The purpose of this analysis is to demonstrate the applicability of geostatistical techniques for identification of overall data worth, data gaps, and optimal future sampling strategies. This report serves as an independent evaluation of existing Total PCBs soils data for the overall delineation of Site impacts.

Geostatistics is a collection of mathematical techniques for the analysis of spatially correlated data. These techniques incorporate the spatial characteristics of actual measured data into statistical estimation processes and are fundamentally different from classical statistical methods, which assume that the collected data are unbiased, un-clustered, and independent (i.e., devoid of any correlations/non spatial). Environmental data are often collected in a biased fashion, are clustered around critical locations, and are expected to display a degree of spatial structure. Environmental contamination is often spatially correlated with release or spill areas. (e.g. tanks, pipes, land-filling, historical operations) and is not randomly distributed or independent of past operations. Geostatistics, in contrast to classical statistics, recognizes these spatial properties and, according to well-defined criteria, provides the statistical tools for quantifying and qualifying contaminant concentrations at environmental sites. The United States Environmental Protection Agency (USEPA) was the first to recognize that environmental data are often highly spatially dependent from the perspective of contaminant delineation. With this recognition, USEPA pioneered the use of geostatistics for environmental data and has developed, along with the American Society of Testing and Materials (ASTM), the guidance and standards utilized for geostatistical analyses for the investigation of environmental sites.

The geostatistical analysis of the CMC Site Total PCBs data set concludes that the existing data set is geostatistically robust and adequate for characterization of Total PCBs concentrations within the property boundary. The geostatistical analysis did not specifically identify any true data gaps. However, one isolated area of data weakness was identified. Thus, only this area is recommended for potential supplemental sampling. While addressing this particular data weakness is not critical from the perspective of completing delineation within the Site boundary, additional concentration data within this area would provide greater resolution to support risk characterization for the Site, if needed.



This geostatistical analysis also addresses potential future horizontal delineation needs along the boundary perimeter. If further delineation is needed based on any exceedances of a Site Total PCB performance standard, the geostatistical analysis could be further utilized. This analysis was used to develop a prescribed optimal sampling strategy based upon a 150-ft spacing. The geostatistics demonstrated that sample spacing closer than 150-ft would only provide redundant data, and alternatively spacing significantly greater than 150-ft would result in a data gap.

## 1.0 Introduction

This report documents the results of the geostatistical analysis of past soil data collected within and adjacent to the Commercial Metals Company (CMC) Site in Corpus Christi, TX (Site). The purpose of this analysis is to demonstrate the applicability of geostatistical techniques for identification of overall data worth, data gaps, and optimal future sampling strategies. This report serves as an independent evaluation of existing Total PCBs soils data for overall delineation of impacts at the Site.

### 1.1 Background

The Site is a 16.3-acre property located at 4614 Agnes Street, Corpus Christi, Nueces County, Texas. The Site is bounded by Navigation Blvd and the City of Corpus Christi water supply tanks to the west, various commercial/industrial businesses to the east, Texas-Mexican Railroad right of way (ROW) and Agnes Street to the south, and a radio tower to the north (CJI, 1998).

The 4614 Agnes St property was formerly operated by General Export Iron and Metal Company in 1951 (CMC, 1996). In April 1976, CMC purchased the property from General Export Iron and Metal Company (CMC, 1996). CMC has operated a secondary metals processing facility at the site since then. CMC currently purchases and processes both ferrous and non-ferrous metals for re-use as raw materials. Materials are brought on-site, separated, and placed into various stockpiles for additional processing. Stockpiled materials are processed on-site using several pieces of large equipment (i.e., mechanical shear, shredder, etc.). Operations have remained virtually unchanged since CMC began operation of the facility (CJI, 1998).

Offices and warehouses are located in the southern portion of the Site. This portion of the Site is surfaced with concrete. The remainder of the facility is typically covered by stockpiles of material pending processing. A concrete roadway completely encircles the facility (CJI, 1998).

Various soil and groundwater investigations have occurred at the Site between 1987 and 2008 by multiple companies and state agencies. Organic and inorganic contaminants of concern (COCs) have been detected in Site soil and groundwater samples. Total PCBs were detected in soil over much of the area of investigation and at concentrations greater than regulatory screening levels. Elevated Total PCB concentrations (>1 milligram per kilogram - mg/kg) have been detected in surface soil over an 18 acre area.



# 2.0 Scope of Analysis

The scope of this geostatistical analysis includes the following:

- Perform exploratory review of existing Total PCBs soil data for the Site.
- Perform geostatistical analyses of Total PCBs in soil, including variography and kriging.
- Make conclusions and recommendations with respect to the overall data worth, data gaps, and if warranted, recommendations for supplemental sampling to address data gaps.

### 2.1 Existing Data

Data used for the analysis consisted of available Total PCBs surface and sub-surface soil data compiled during various investigations completed from 1987 to 2008. The following table provides summary statistics of the Total PCBs data available.

**Table 2.1 Total PCBs Summary Statistics** 

Statistic	Value
Count	396
Minimum Value	0.000162 mg/kg
Maximum Value	2,670 mg/kg
2 <sup>nd</sup> Maximum Value	437 mg/kg
Average Value	18.2 mg/kg
Maximum Depth	23 ft

### 2.2 Report Structure

This report is presented in the following sections, as:

- Section 3: Data Analysis Methodology
- Section 4: Data Compilation
- Section 5: Exploratory Data Analysis
- Section 6: Geostatistical Analysis
- Section 7: Proposed Supplemental Sampling Strategies



# 3.0 Data Analysis Methodology

### 3.1 Geographical Information System

A geographic information system (GIS) database was provided by WESTON prior to this geostatistical analysis. In addition to pertinent site information, such as registered aerial photographs and former and current structures and site features, the GIS also included soil sampling results for the entire Site. Information relating to or within the Site were taken as a subset of the base GIS. Site analytical data were imported into a Microsoft Access database to allow for querying and statistical summarization of the data.

GIS is used as a means for exploratory data analysis, iso-concentration mapping, and visual presentation of findings and conclusions. The completed geostatistical output, including variography and kriging grid files, are provided in Appendix A.

### 3.2 Statistical Methods

Environmental field data usually display a wide range of variability at a site. Such erratic variations led the United States Environmental Protection Agency (USEPA) to recommend the use of statistical methods for environmental remedy decision-making (e.g., USEPA, 1989a, 1997). As part of the exploratory data analysis, Site soil data are subjected to statistical analyses, including probability plot analysis. These techniques are standard procedures that are discussed widely in statistical text books, such as Helsel and Hirsch (1995) or Haan (1997).

Probability plots are highly effective graphical tools for determining the type of the statistical distribution of measured values of a contaminant. A straight-line probability plot of the raw data indicates that the data are normally distributed. In absence of a straight line, if the data are log-transformed (taking the natural log of raw data), which results in a straight-line, then this would imply a log-normal distribution. A segmented probability plot usually suggests the presence of multiple populations among measured values. In many instances, the presence of multiple populations can be attributed to the co-existence of residual and hot spot data.

### 3.3 Geostatistical Methods

Geostatistics is a collection of techniques for the analysis of spatially correlated data. These techniques incorporate the spatial characteristics of actual data into statistical estimation processes. Geostatistics permit the performance of critical tasks, such as optimization of



mapping of spatial variables, estimating average block values, and the optimal design of sampling and monitoring schemes. Classical or non-spatial statistical methods assume that the collected data are unbiased, un-clustered, and independent (i.e., devoid of any correlations). However, field environmental data are collected in a biased fashion, are clustered around critical locations, and are expected to display a degree of spatial structure. Geostatistics, in contrast to classical statistics, recognizes these properties and, according to well-defined criteria, provides the statistical tools for achieving the following (Matheron, 1971; Journel and Huijbregts, 1978 Isaaks and Srivastava, 1989; ASCE, 1990a and 1990b):

- Quantifying correlation structures of the spatial data sets;
- Calculating the most accurate estimations based on sample results and other relevant information:
- Quantifying the accuracy of these estimations;
- Generating equally likely realizations of a random field conditional to the available field measurements; and
- Selecting the variables and locations to be sampled, if necessary.

USEPA has taken the lead in promotion of geostatistics by producing the first public-domain software package, known as GEO-EAS (Geostatistical Environment Assessment Software) developed by Englund and Sparks (EPA/600/4-88/033a, 1988). This package was followed by another USEPA package, known as GEOPACK, developed by Yates and Yates (EPA/600/8-90/004, 1990). The successful results of application of GEOEAS prompted USEPA to recommend its use in spatial environmental data analysis, as stated in "Guidance for Data Usability in Risk Assessment" (EPA/540/G-90/008, 1990) and "Basics of Pump-and-Treat Ground-Water Remediation Technology" (EPA/600/8-90/003, 1990). The American Society of Testing and Material (ASTM, 1994, 1996a and 1996b) has issued a series of standard guides for geostatistical site investigations.

### 3.4 Methodology – Geostatistics

This section provides further information regarding geostatistical techniques. Conceptually, the geostatistical techniques quantify the correlation between data points. Put somewhat differently, if we know the value of a measurement, e.g., concentration of contamination at a point "A", geostatistics quantify the extent to which we can predict the contamination concentration at a point "B". If the prediction can be made with a high degree of accuracy, the



data are said to be strongly correlated and the data set is said to display spatial structure. If, on the other hand, knowing the concentration of contaminant at point A tells us nothing about the concentration at point B, points A and B are said to be uncorrelated, and the data set displays no spatial structure (i.e., is random). For example, in a hypothetical, circular, uniform plume of contamination, knowing the concentration of contamination at any point in the plume (point A) allows one to predict the concentration of contamination at any other point in the plume (point B) to a high degree of accuracy, i.e., points A and B are strongly correlated. To the extent contaminant concentrations within the plume vary, the degree of correlation between any point A and any point B weakens. If the correlation continues to weaken to the point where no relationship is observed between points A and points B, then the data are considered to be completely random.

Geostatistics utilizes rapid computational procedures to compare all points in a data set with all other points in the data set to provide a consistent measure of their degree of correlation. The computed correlation between data points (i.e., the plot of the "variogram" of the data set) allows for the assessment of the type of spatial structure existing in the data set.

In addition, geostatistics allows for the estimation of the aerial extent and orientation of identified spatial structures. Estimating the aerial extent of the plume is mathematically accomplished by determining the "range" of the variogram of the data set. Generally, if the contaminant concentration is known at point A in a plume, and point B (unknown concentration) is immediately adjacent to point A, the concentration at point B should be more or less equal to the concentration at point A. In other words, knowing the concentration at point A allows prediction of the concentration at point B to a high degree of accuracy. As the distance between points A and B increase, the ability to predict concentrations at Point B decreases (e.g., the natural variability of the plume would confound attempts to predict, or the edge of the plume would be encountered). At some distance between points A and B, prediction of a contaminant concentration at point B with any significant degree of accuracy would end. Using the above example (circular, uniform plume), if point A is at the center of the plume with a known the concentration, as point B moves farther and farther from A, a strong correlation exists until the distance between points A and B exceed the radius of the plume. That distance, whatever it is, is the "range" of point A.

By data analysis and not by prior knowledge, the likely orientation of a spatial structure can be computed by calculating the overall range of point A in all directions (an "omni-directional analysis") and by comparing that range to a range calculated along a specific axis. If the range of the data along a specific axis is greater than the calculated range in all directions, the structure has a non-circular shape. If the range along the east-west axis, for example, is greater than the range calculated along any other axis, the structure generally has an east-west orientation.

### 3.5 Variogram Analysis

A geostatistical analysis must be initiated by a variogram<sup>1</sup> analysis for quantifying the correlation between data points. The spatial structures of field data are determined through computation of sample variograms. For this purpose, all pairs of measurement values in a data set are compared to each other in order to provide a consistent measure of their degree of spatial correlation. The resulting differences between paired measurements are then grouped according to their separation distance and the orientation of their separation vector. For each specific orientation (direction), the grouped differences are plotted with respect to their separation distances, yielding the so-called sample variogram plot. This plot allows the user to quantify and model the spatial correlation among the investigated data along targeted directions.

To construct the sample variogram, all pairs of measurements are identified. For n measurements, there are n(n-1)/2 measurement-pairs (e.g., 100 measurements yield 4,950 pairs). For each pair of measurements, three values are calculated: (1) one-half of their squared difference, (2) their separation distance, and (3) the relative geographical orientation of two measurement points. For example, in the following diagram (Diagram 1), the pair of measurement points A and B have a one-half-squared-difference of 50 ppm<sup>2</sup> (=0.5(15-5)<sup>2</sup>), are separated by 120 feet, and are oriented along the Northeast-Southwest direction.

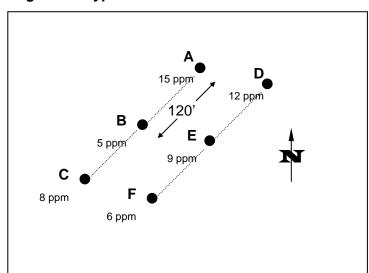
Diagram 1. Pair of Samples

EPA/600/4-88/033a defines the variogram as the plot of the variance (one-half the mean squared difference) of paired sample results as a function of their separation distance.

Having computed all the pair values, the sample variogram can be constructed. For this purpose, first,



the desired direction of the variogram must be defined. As noted above, a variogram can be computed along various axes to evaluate correlation structures of the data set along different directions. For each selected direction, all pairs having the desired alignment are identified. For example, in the hypothetical example below (Diagram 2), there are 6 measurement points (A, B, C, D, E, and F). There are a total of 15 pairs (A:B, A:C, A:D, A:E, A:F, B:C, B:D, B:E, B:F, C:D, C:E, C:F, D:E, D:F, and E:F). When computing the variogram along the northeast-southwest direction, 6 pairs (A:B, A:C, B:C, D:E, D:F, and E:F) are used. For pairs having the same separation distance, the average one-half-squared difference value is computed. For example, in the diagram below, along the northeast-southwest direction, of the 6 identified pairs, four of them (A:B, B:C, D:E, E:F) are 120 feet apart with an average one-half-squared-difference of 15.875 ppm² (=.5[(15-5)²+(5-8)²+(12-9)²+(9-6)²]/4). The other two pairs (A:C and D:F) are 240 feet apart with an average one-half-squared-difference of 21.25 ppm² (=.5[(15-8)²+(12-6)²]/2). The plot of these average one-half-squared-differences versus their separation distances is referred to as the sample variogram plot².



**Diagram 2: Hypothetical Data Set** 

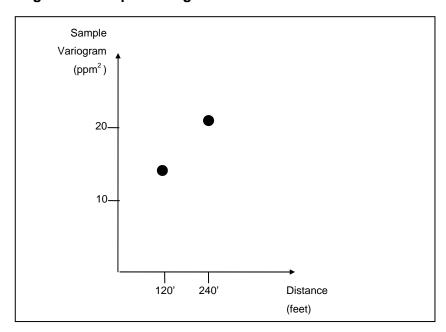
NEWFIELDS

<sup>&</sup>lt;sup>2</sup> The plot of all one-half-squared-differences versus their separation distances is referred to as the variogram cloud diagram, which is commonly used in exploratory review of variograms.

CMC Site December 2010

For the hypothetical example above, the sample variogram plot for the northeast-southwest direction is shown below (Diagram 3).

**Diagram 3: Sample Variogram Plot** 



Mathematically, the variogram is defined as:

$$\gamma_{ij} = \frac{1}{2} E[Z_i - Z_j]^2$$

where,

 $y_{ij}$  = (semi-)variogram between  $Z_i$  and  $Z_j$ ;

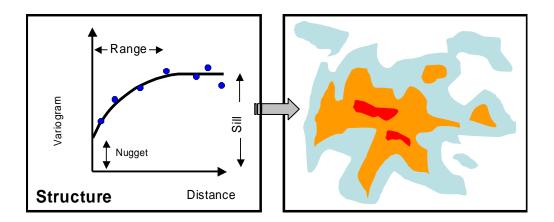
 $Z_i$  = data value at the i<sup>th</sup> sample locations; and

E = the expected value operator.

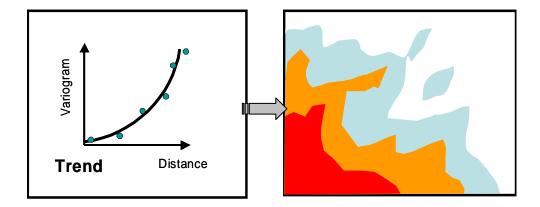
Each data set has its own sample variogram characteristics. The variogram of a data set exhibiting correlation is qualitatively and quantitatively different from the variogram of a data set that is random. For data, which display well-defined correlation, the variogram plot can be used to measure the spatial extent of related data (i.e., its "range"). For example, consider the following hypothetical examples:



**Structured Variogram**: This type of variogram plot (see below) indicates that the nearby data points in the data set are related to each other. That is, they exhibit a spatial pattern. The spatial extent of the pattern can be calculated based on the size of the range, as shown in below. Types of environmental data that will exhibit structured variograms are old or weathered releases or plumes (see below).



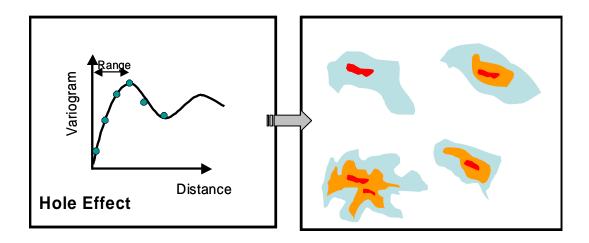
**Trend**: This type of variogram plot (see below) indicates that the measured values are gradually increasing from one zone to another. Types of data that will exhibit trend variograms are ongoing or active releases such as a leaking underground storage tank (see below).



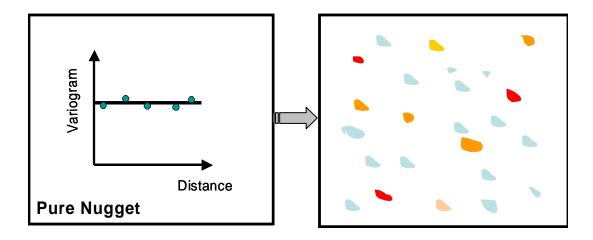


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**Hole-Effect Variogram**: This type of variogram plot (see below) indicates that the related data are clustered in isolated pockets. The average size of these isolated pockets can be calculated based on the range, as shown below. Types of data that will indicate a hole-effect include areas with multiple "hot-spots" surrounded by ambient or unimpacted type data.



**Pure-Nugget Variogram**: This type of variogram plot (see below) indicates a case where the data are devoid of any spatial structure, i.e. completely random. Types of data that will exhibit pure-nugget variograms are ambient or unimpacted areas (see below).



In this investigation, directional variograms of various contiguous measurements are also assessed. This is performed by comparing the fitted omni-directional model to directional sample variograms. This was completed during the variography process; the results indicated that investigated variables are devoid of any discernable directional tendencies. Therefore, only the omni-directional variograms are presented.



In this investigation, directional variograms of various contiguous measurements are also assessed. This is performed by comparing the fitted omni-directional model to directional sample variograms. A general consistency of the directional sample variograms with the fitted model indicates that investigated variables are devoid of any discernable directional tendencies.

### 3.6 Geostatistical Estimation

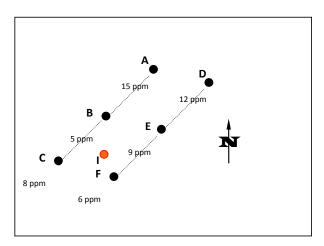
Upon determination of the variogram model, point or block kriging can be done. For point kriging, we need to know the location of the point. For block kriging, we need to know the dimensions of the block, as well as the location of its center. The process is described in the following example.

In the above diagram, the estimated concentration at point "I" is a "linear" sum of its neighboring measured concentrations and is expressed as follows:

$$C_I = W_A C_A + W_B C_B + \cdots + W_F C_F$$

Note that the " $\boldsymbol{W}$ " (the kriging or estimation weights are not known yet). The estimation standard deviation of  $C_1$  ( $S_i$ ) is as follows:

$$\mathbf{S}_{I} = \mathbf{W}_{A}^{2} \mathbf{N} + \mathbf{W}_{A} \mathbf{W}_{B} \mathbf{\gamma}_{A,B} + \mathbf{W}_{A} \mathbf{W}_{C} \mathbf{\gamma}_{A,C} + \cdots + \mathbf{W}_{E} \mathbf{W}_{F} \mathbf{\gamma}_{E,F} - \mathbf{W}_{A} \mathbf{\gamma}_{A,I} - \cdots - \mathbf{W}_{F} \mathbf{\gamma}_{F,I}$$



**N** is the nugget effect, and  $\gamma_{A,B}$  is the variogram between point A and B whose value is computed based on the fitted variogram model, as a function of the distance between points A and B and the direction between them.  $\mathbf{S}_{l}^{2}$  is referred to as the estimation or kriging variance.

Point Kriging is now performed automatically by selecting the set of values for  $W_A$  through  $W_F$  to minimize the  $S_I$  (i.e., the <u>Best</u>

Estimator), such that the sum of the selected weights will be exactly equal to one (i.e., the <u>Unbiased Estimator</u>). This minimization is conducted through a process known as the Lagrange Multiplier Technique. The resulting estimated value is referred to as the Best, Linear, Unbiased Estimator or "BLUE."



Similar to the above process, block kriging can be performed where "I" represents a block with defined boundaries. Under this scenario,  $\eta_{A}$  is the variogram between block I and point A. This process allows kriging to compute the average value over a block along with its measure of accuracy.

### 3.7 Geostatistical Software

In this investigation, NewFields' Geostat for ArcView<sup>™</sup> is used. This software is produced on the basis of GSLIB (Deutsch and Journel, 1992), which was also the foundation of USEPA GEO-EAS. NewFields' software works within the ArcView GIS software as an extension. This extension is linked to Visual Basic and FORTRAN executables to calculate and map the sample variograms and compute kriged estimates.

### 3.8 Geostatistical Standards

In this investigation, the geostatistical analyses and computations are conducted and reported according to the following American Society of Testing and Material (ASTM) Standards:

- D5549 Standard Guide for Reporting Geostatistical Site Investigations (ASTM, 1994);
- D5922 Standard Guide for Analysis of Spatial Variation in Geostatistical Site Investigations (ASTM, 1996a); and
- D5923 Standard Guide for Selection of Kriging Methods in Geostatistical Site Investigations (ASTM, 1996b).
- D5924 Standard Guide for Selection of Simulation Approaches in Geostatistical Site Investigations (ASTM, 1994).

# 4.0 Data Compilation

Electronic sample data were ported into a Microsoft Access database. The compiled data included the Total PCBs measured concentrations, as well as physical information on the actual sample, such as sample date, depth, type and coordinate location. Once the data were compiled into the Access database, exploratory statistical summaries were performed, such as depth averaging. All analytical data incorporated within the GIS were directly exported from the Access database.

Before data were subjected to any further analysis, the following issues were addressed:

• Depth intervals were converted to average depth values below ground surface for evaluation purposes, i.e. (Top Depth + Bottom Depth)/2.



 For locations with more than one sample at the same defined interval, the maximum value was used.

Three discrete depth intervals were evaluated: 0-1 FT, 0-5 FT, and greater than >5 FT intervals. Thus, three datasets were queried from the database accordingly.

# 5.0 Exploratory Data Analysis

### 5.1 Spatial Distribution of Total PCBs

Elevated Total PCBs concentrations (greater than 1.0 mg/kg) are predominantly present in the northern portion of the property with some isolated elevated concentrations in the central southern portion of the property. Visually, there is sample coverage throughout the entire property with dense coverage in the northern portion near the tin and automobile scrap area. Inspection of current aerial photography indicates the presence of scrap piles scattered throughout the property. The distribution and concentration gradients are illustrated on Figure 5.1.1 (below).

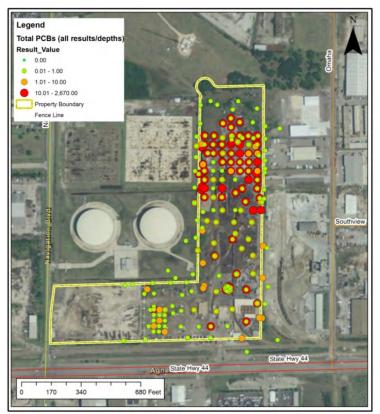


Figure 5.1.1 – Total PCBs Sample Results – mg/kg



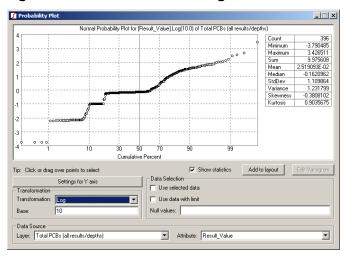
### 5.2 Probability Plots of Lead

To investigate the statistical distribution of the Total PCB surface soil data, the corresponding probability plots measured and log-transformed data are displayed on Figures 5.2.1-a, and 5.2.1-b, respectively. The summary of findings are as follows:

• Probability plot of Total PCBs data (Figure 5.2.1-a) displays a curved/segmented shape that is attributable to non-normality of the measured data with the presence of an anomalous value of 2,670 mg/kg. The probability plot of log-transformed Total PCBs data (Figure 5.2.1-b), even though segmented, is much closer to a straight line and is thus used to determine to be a non-normal population distribution. In order to decipher the underlying variogram of Site Total PCBs data, in all the subsequent variogram analyses for each sample interval, log-transformed Total PCBs data are used.

Figure 5.2.1-a - Probability Plot Total PCBs





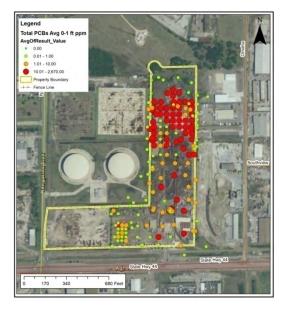


# 6.0 Variogram Analysis of Total PCBs

### 6.1 Total PCBs – 0 to 1 ft Sample Interval

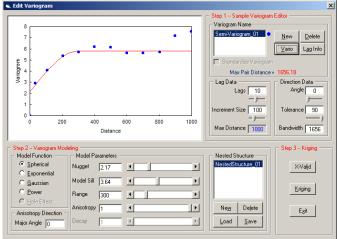
The first scenario to be evaluated is the 0-1 ft sampling interval where the distribution of samples and corresponding concentration gradient is illustrated in Figure 6.1 below.

Figure 6.1 – Total PCBS (0-1 ft) Spatial Distribution



The omni-directional variogram of log-transformed Total PCB 0-1 ft surface soil data is presented in Figure 6.1-a. The data set displays a consistent 'structured' spatial correlation. The fitted omni-directional variogram of Total PCBs has a range of 300 feet. This demonstrates that the Total PCBs data are correlated and that concentrations can be estimated with a measurable level of statistical confidence between sample points that are no greater than 300 ft apart.

Figure 6.1-a Total PCBs 0-1 ft Omni-Directional Variogram



The above fitted omni-directional variogram model of log-transformed Total PCBs data is also compared to its corresponding directional sample variograms, as displayed on Figure 6.1-b. To



test for directional tendencies/correlation (i.e. anisotropy), variograms are created for the following orientations: 0° (N:S) 45° (NE:SW), 90° (E:W), and 135° (SE:NW) within 22.5° tolerance windows. If any of these variograms demonstrated a greater range of correlation when compared to the omni-directional range (300 ft), then the variogram model would be adjusted to recognize the directional influences. In this case, the Figure indicates that all directional scenarios variable do not display any discernable directional tendencies and are consistent with the omni-directional range of correlation. Therefore, the omni-directional variogram is used for next analysis.

<u>D</u>elete 20 Lag Info Lags 20 Tolerance 90 800 1200 1400 1600 Spherical Nugget 2.17 F X-Valid C Exponential Model Sill 3.64 1 F <u>K</u>riging Range 300 1 E Þ Ne<u>w</u> Delete E<u>x</u>it Anisotropy Direction Major Angle 0

Figure 6.1-b – Total PCBs 0-1 ft Anisotropy Check

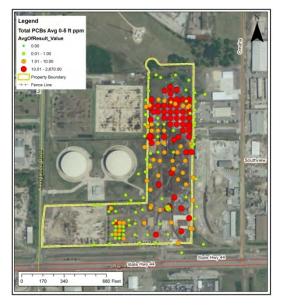
In the subsequent analyses, the above estimated variogram range was used. The variogram ranges provide measures for determining the average grid size of the sampling points covering those areas that are not adequately sampled.

### 6.2 Total PCBs – 0 to 5 ft Sample Interval

The second scenario to be evaluated is the 0-5 ft sampling interval where the distribution of samples and corresponding concentration gradient is illustrated in Figure 6.2 below.

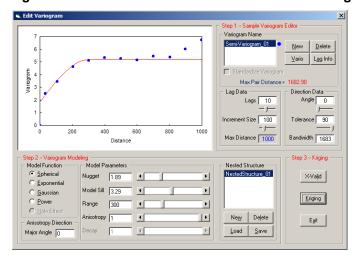


Figure 6.2 – Total PCBS (0-5 ft) Spatial Distribution



The omni-directional variogram of log-transformed Total PCBs 0-5 ft surface soil data is presented in Figure 6.2-a. The data set displays, similar to the 0-1 ft interval, also displays a consistent 'structured' spatial correlation. The fitted omni-directional variogram of Total PCBs also has a range of 300 feet. This demonstrates that the Total PCBs data are correlated and that concentrations can be estimated with a measurable level of statistical confidence between sample points that are no greater than 300 feet apart.

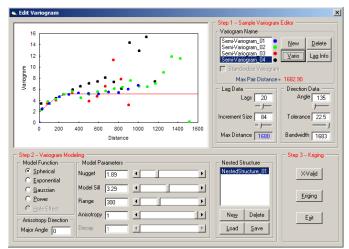
Figure 6.2-a Total PCBs 0-5 ft Omni-Directional Variogram



The above fitted omni-directional variogram model of log-transformed Total PCBs data is also compared to its corresponding directional sample variograms, as displayed on Figure 6.2-b. To test for directional tendencies/correlation (i.e., anisotropy), variograms are created for the following orientations: 0° (N:S) 45° (NE:SW), 90° (E:W), and 135° (SE:NW) within 22.5° tolerance windows. If any of these variograms demonstrated a greater range of correlation when compared to the omni-directional range (300 ft), then the variogram model would be adjusted to recognize the directional influences. In this case, similar to the previous 0-1 ft interval variogram, the Figure indicates that all directional scenarios variable do not display any discernable directional tendencies. Therefore, the omni-directional variogram is used.



Figure 6.2-b – Total PCBs 0-5 ft Anisotropy Check



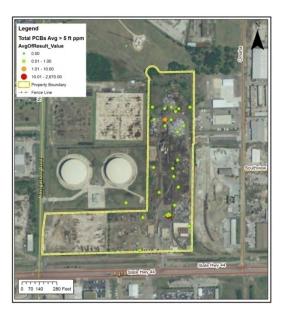
In the subsequent analyses, the above estimated variogram range was used. The variogram ranges can provide measures for determining the average grid size of the sampling points covering those areas that are not adequately sampled.

### 6.3 Total PCBs - > 5 ft Sample Interval

The third scenario to be evaluated is the >5 ft sampling interval where the distribution of samples and corresponding concentration gradient is illustrated in Figure 6.3 below.

### Figure 6.3 – Total PCBS (>5 ft) Spatial Distribution

For the > 5 ft depth interval scenario, there are only two samples that exceed the 1.0 mg/kg



standard where the overall majority are at or near the detection limits. Overall, there does not appear to be any elevated concentrations at this deep interval. Moreover, the two exceedances values additional proximal samples (< 300 ft) that have concentration below the 1.0 mg/kg standard at greater depths. In all, no substantive impacts are evident at this deep interval, and the two independent exceedances samples are already vertically bounded proximal samples. Therefore, further no geostatistical analysis was completed this scenario.



# 7.0 Geostatistical Estimation - Kriging

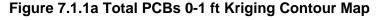
Kriging is a weighted moving average method used to interpolate values from a sample data set onto a regular grid for contouring. The kriging weights are computed from the previously calculated variogram model, specifically based on the degree of correlation among sample values in the area as a function of the distance and direction between samples. Kriging smoothes, or regresses, estimates based on the proportion of total sample variance accounted for by random "noise". The noisier the data set, the less individual samples represent their immediate vicinity, and the more they are smoothed. This often results in a conservative overestimation of impacted area boundaries. Kriging also neglects physical and natural boundaries, e.g., swales, buildings, etc. Therefore, professional interpretation and judgment must be used when contouring the kriged output. Given a variogram representative for the area to be estimated, kriging will compute the most precise estimates possible from the available data. Kriging can adjust for anisotropy (directional tendencies) in the correlation by increasing the weights in the higher correlated direction. However, for these data sets no directional correlation was apparent. Additionally, with each kriging estimate for the Total PCBs concentration value comes a kriging variance (often referred to estimation error), which quantifies the statistical confidence the kriged concentration. Areas identified with high estimation variance would be selected as potential areas for supplemental sampling.

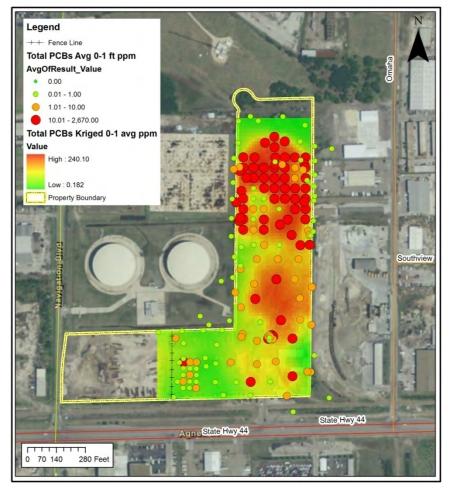
### 7.1 Total PCBs Kriging Results

Using the fitted omni-directional variogram models, kriging contour maps of both Total PCBs concentrations and associated estimation variance were generated for the 0-1 ft and 0-5 ft intervals. Where sample locations contain more than one sample for a given depth interval, kriging uses the average concentration among multiple samples. The kriging results are illustrated in the Figures below.



CMC Site December 2010





The above Figure shows that kriging concentration values were able to be determined throughout the entire study area. If the kriged contour maps result in areas with no (i.e., blank) kriged concentrations, then this would be considered an obvious or substantive data gap where supplement sampling in necessary. In this case, no obvious data gap exist for the 0-1 ft interval for Total PCBs in soil. However, the next data gap assessment involves the quality or estimation variance of the kriged concentrations that are evaluated below.

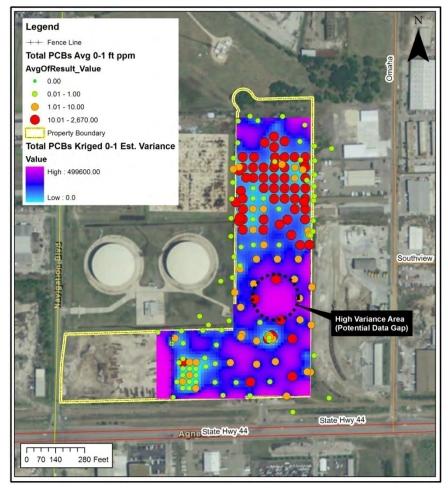


Figure 7.1.1b Total PCBs 0-1 ft Kriging Estimation Variance Map

The above Figure shows a color gradient indicating areas where low estimation variance is encountered (blue) versus areas where high estimation variance is encountered (purple). With respect to the identification of 'data gaps', a combination of several factors are considered including the high variance areas identified, the range of correlation from the variography, and the delineation/characterization performance standard. This analysis involves a certain degree of engineering judgment; as a rule of thumb, a 'data gap' is considered as a high variance area (purple) larger than ½ the original range of correlation from the variography (300/2 = 150 ft). In this case, one area meets that criteria as annotated above. This area is in the center of the Site and is identified as a potential data gap. Supplemental sampling should be considered for this area, if it is deemed appropriate in context with the delineation/characterization needs relative to risk assessment or remedial decisions. In that regard, if additional data are determined to be of value, then only one (1) additional sample would be necessary to fill the 'data gap', where the high estimation variance would be in turn eliminated.



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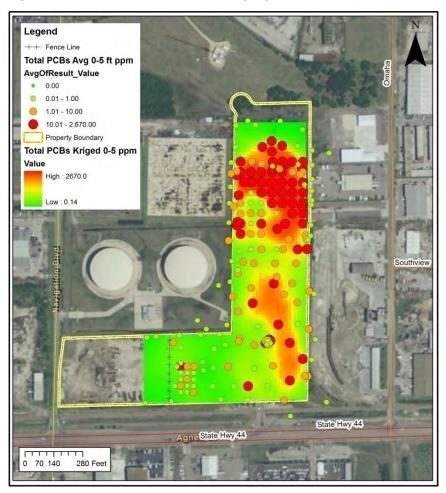


Figure 7.1.2a Total PCBs 0-5 ft Kriging Contour Map

The above Figure shows that kriging concentration values were able to be determined throughout the entire study area. Again, if the kriged contour maps result in areas with no (i.e., blank) kriged concentrations, then this would be considered an obvious or substantive data gap where supplement sampling in necessary. In this case, as with the 0-1 ft scenario, no obvious data gaps exist for the 0-5 ft interval for Total PCBs in soil. However, the next data gap assessment involves the quality or estimation variance of the kriged concentrations that are evaluated below.



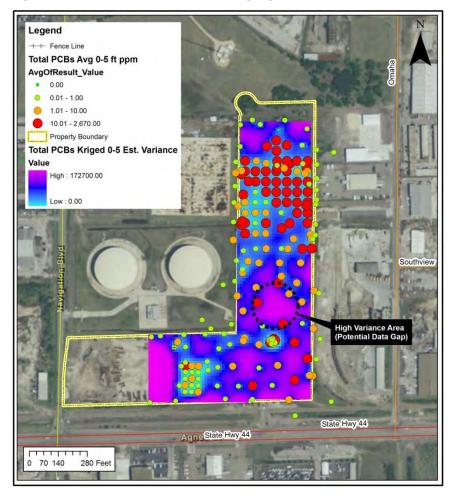


Figure 7.1.2b Total PCBs 0-5 ft Kriging Estimation Variance Map

Analogous to the 0-1 ft scenario, the above Figure shows a color gradient indicating areas where low estimation variance is encountered (blue) versus areas where high estimation variance is encountered (purple). Using the same rationale previously described with the 0-1 ft interval scenario, one area meets the 'data gap' criteria as annotated above. This is the same area identified in the previous 0-1 ft scenario. Thus, supplemental sampling should be considered for this area, and if it is deemed appropriate in context with the delineation/characterization needs relative to risk assessment or remedial decisions. In that regard, if additional data are determined to be of value, then only one (1) additional sample would be necessary to fill the 'data gap', where the high estimation variance would be in turn eliminated.



# 8.0 Proposed Supplemental Sampling Strategy

The existing data set is geostatistically robust and is adequate for characterization of Total PCBs concentrations within the property boundary. The geostatistical analysis did not specifically identify a true data gap, but rather only one area of data weakness. Thus, only this area is identified for potential supplemental sampling. This area would only require a single sample location under either sample interval scenario (0-1 ft or 0-5 ft). Addressing this particular data gap is not critical from the perspective of completing delineation within the Site boundary. However, additional concentration data within this area would provide greater resolution to support risk characterization for the Site.

Before any additional horizontal delineation is contemplated in areas along the boundary perimeter, the following factors should be evaluated:

- Unbounded exceedances of the applicable performance standard,
- Sample depth interval being considered,
- · Proximity to risk receptors, and
- Potential future land use.

If consideration of the above results in the identification of areas that require further horizontal delineation, then the geostatistical analysis could be used to determine the location of any additional samples. Specifically, a prescribed sampling strategy based upon the 300-ft range of correlation can be determined from the Total PCBs data variography. That is, if further horizontal delineation of any area along the perimeter of the Site is desired, a prescribed sample distance of ½ the range of correlation (300/2 = 150 ft) is recommended. Sample spacing closer than 150 ft would only provide redundant data, and alternatively, any spacing greater than 300 ft would result in a data gap. Thus, any future sampling should be located based upon 150 ft spacings. The figures below (Figure 8.1 and 8.2) illustrate where potential horizontal delineation data gaps may exist with respect to evaluation of performance standard exceedances only. The final determination of specific area and sample counts would need to be based upon the previous discussion.



Figure 8.1 Horizontal Delineation Data Gaps (0-1 ft)

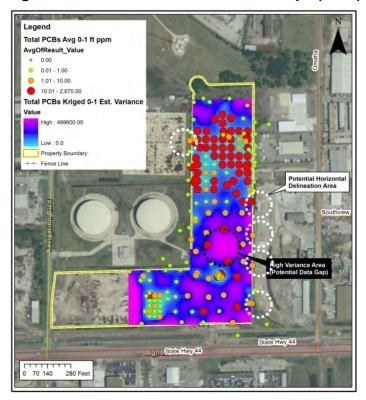
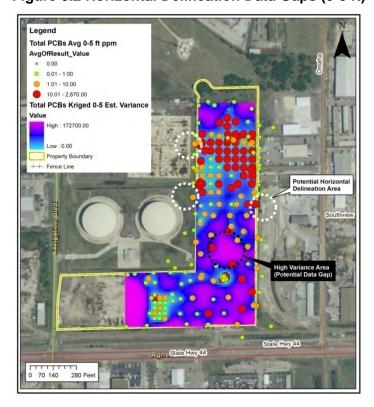


Figure 8.2 Horizontal Delineation Data Gaps (0-5 ft)





## 9.0 References

ASCE Task Committee on Geostatistical Techniques in Geohydrology, S. Rouhani, Chairman and Principal Author, Review of Geostatistics in Geohydrology, I. Basic concepts, *ASCE Journal of Hydraulic Engineering*, 116(5), 612-632, May 1990a.

ASCE Task Committee on Geostatistical Techniques in Geohydrology, S. Rouhani, Chairman and Principal Author, Review of Geostatistics in Geohydrology, II. Applications, *ASCE Journal of Hydraulic Engineering*, 116(5), 633-658, May 1990b.

ASTM, Standard Guide for Reporting Geostatistical Site Investigations, D 5549, 1994.

ASTM, Standard Guide for Analysis of Spatial Variation in Geostatistical Site Investigations, D5922, 1996a.

ASTM, Standard Guide for Selection of Kriging Methods in Geostatistical Site Investigations, D 5923, 1996b.

Commercial Metals Company (CMC). 1996. Voluntary Cleanup Program Application submitted to TNRCC VCP, Austin, TX. 10 October 1996.

Cook-Joyce, Inc. (CJI). 1998. Site Investigation Report for Commercial Metals Company, Corpus Christi, TX. VCP No. 222. Austin, TX. 18 December 1998.

Deutsch, C. V., and A. G. Journel, *GSLIB: Geostatistical Software Library and User's Guide*, Oxford University Press, 1992.

Englund, E., and A. Sparks, GEO-EAS (Geostatistical Environmental Assessment Software) User's Guide, EPA600/4-88/033, ENMSL, Environmental Protection Agency, Las Vegas, 1988.

Haan, C.T., Statistical Methods in Hydrology, Iowa State University, 1977.

Helsel, D. R. and Hirsch, R. M., Statistical Methods in Water Resources, Elsevier, 1995.

Isaaks, E.H., and R.M. Srivastava, Applied Geostatistics, Oxford University Press, 561 p., 1989.

Journel, A.G., and C.J. Huijbregts, *Mining Geostatistics*, Academic Press, London, 600 p., 1978.

Matheron, G., *The Theory of Regionalized Variables and Its Applications*, Les Cahiers du Centre de Morphologie Mathématique de Fontainebleau, No. 5, 211 p., 1971.

USEPA, Methods for Evaluating the Attainment of Cleanup Standards, Volume 1: Soils and Soil Media, EPA230/02-89-042, 1989a.

USEPA, *Data Quality Evaluation Statistical Toolbox (DataQUEST), User's Guide*, EPA QA/G-9D, QA96 Version. EPA/600/R-96/085. Washington, DC: Office of Research and Development. December, 1997.



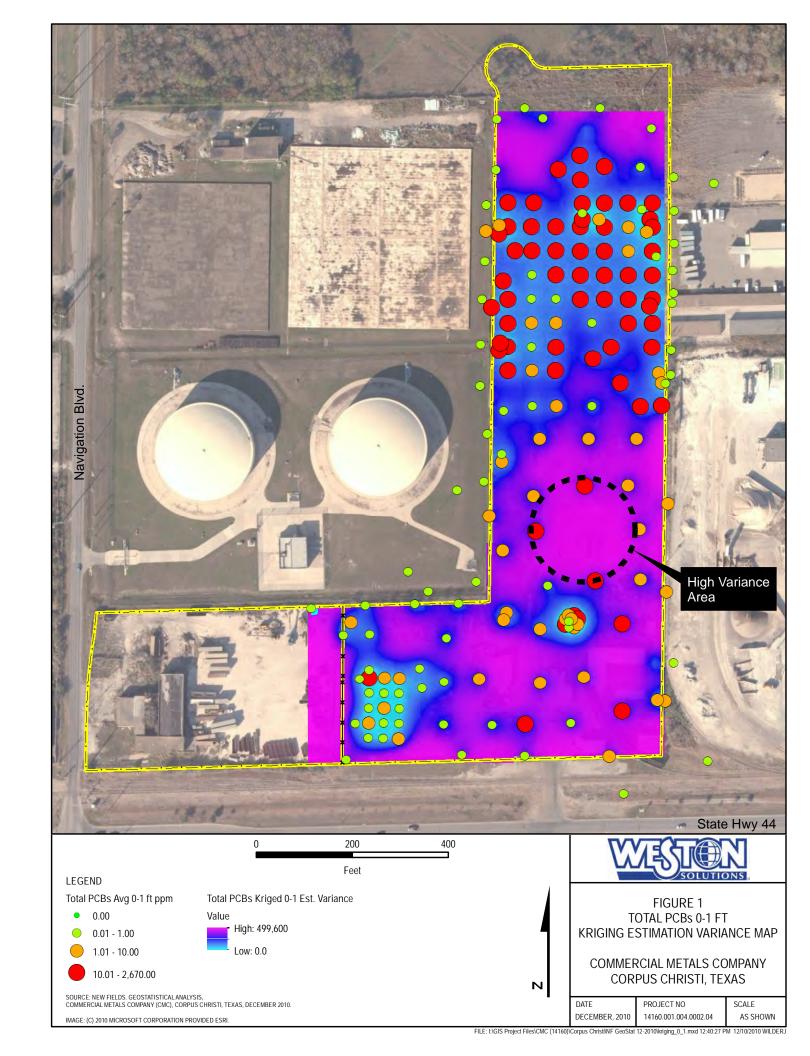
CMC Site December 2010

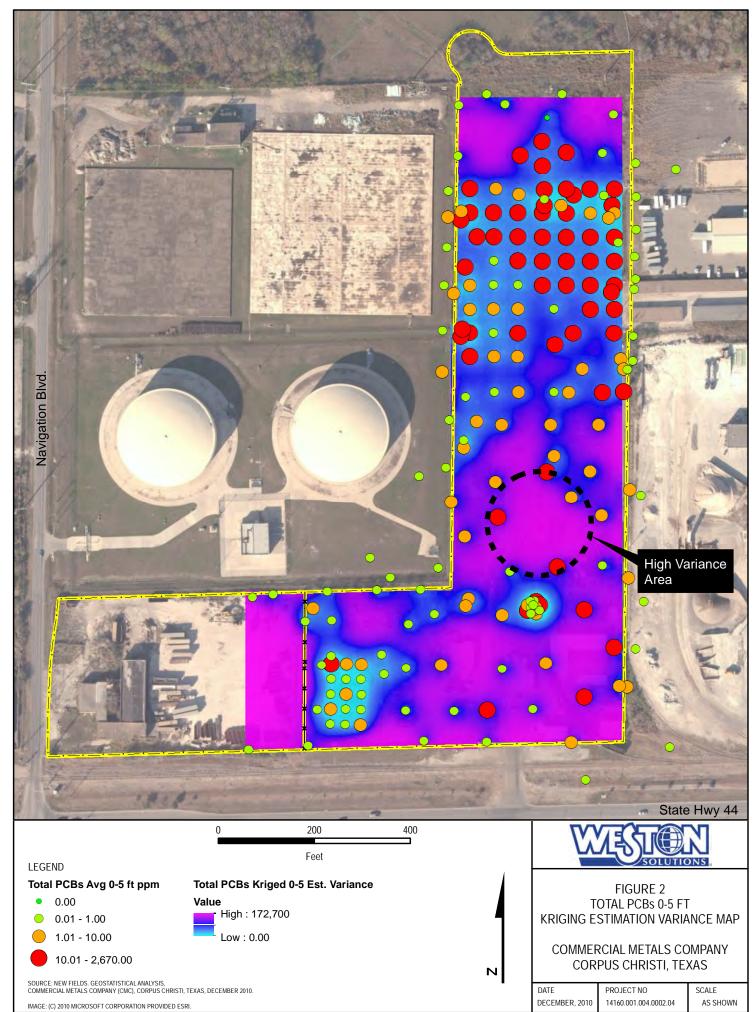
Yates, S.R. and M.W. Yates, 1990 Geostatistics for Waste Management: A Users's Manual for the GEO PACK (Version1.0) Geostatistical Software System. EPA/600/8-90/004 (NTIS PB90-186420/AS).

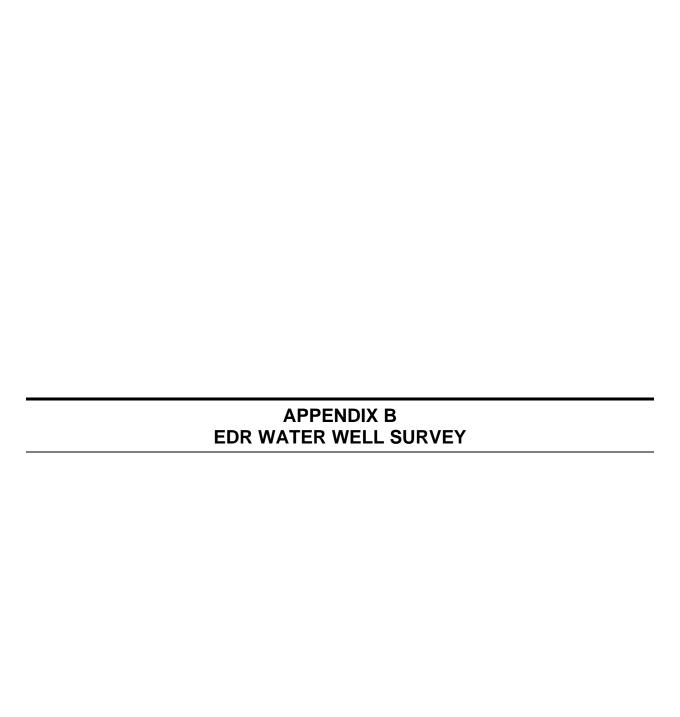
CMC Site December 2010

## **APPENDIX A**











# The EDR Water Well **Review**

**Commercial Metals Company** 4614 Agnes St Corpus Christi, TX 78408

Inquiry Number: 2083176.1

November 29, 2007

# The Standard in **Environmental Risk** Information

440 Wheelers Farms Road Milford, Connecticut 06461

## **Nationwide Customer Service**

Telephone: 1-800-352-0050

Fax:

1-800-231-6802

Internet:

www.edrnet.com

## Environmental Data Resources, Inc. Water Well Review Report

EDR reviewed available records made public by the state of Texas at the Texas Water Development Board (TWDB) and the Texas Commission Environmental Quality (TCEQ) and obtained information identifying the approximate location of public and private water wells within the requested Area of Review (AOR). EDR researched the located and plotted water wells identified on county highway maps or USGS 7.5 minute topographic maps at the TWDB. EDR transferred the approximate water well locations onto a map for the client's review.

EDR cannot guarantee the accuracy of the information provided by state agencies. This review is intended to provide the user with a "working approximation" of reported well locations. The following are guidelines used to review available driller logs for water wells associated with client site information within the AOR.

- Identify Located Wells within the AOR according to the TWDB maps.
- Identify Plotted Wells within the AOR according to the TWDB maps.
- Identify Partially Numbered Wells within the AOR according to the TCEQ files containing records submitted by the well driller.
- Identify Unnumbered Wells within the AOR according to the TCEQ files containing records submitted by the well driller.

## **Description of Terms**

## Standard Area of Review-(AOR):

Standard area of review is a 1/2 mile radius around client specified target property.

## **Located Water Well:**

Well locations that have been field checked by a TWDB or USGS staff member, spotted on a USGS 7.5' Topographical or county highway map, assigned a unique identification number, and filed at the TWDB.

## Plotted Water Well:

Approximate well locations spotted on county highway maps by the TWDB staff members according to information submitted on the driller's log. The accuracy of the location for these wells is dependent on the driller. The state assigned unique identification numbers to these wells, but in high-density areas, a single identification number may represent multiple well locations. The TWDB eliminated this plotting activity in June 1986.

## Partially Numbered Water Well:

Water well locations established to within a 2.5 minute topographic quadrangle and identified by the TCEQ according to maps submitted with the driller's log. Each water well was assigned a State ID number by the TCEQ. Note: This method for recording water well locations was procedure from 1986 to 1991.

#### **Unnumbered Water Well:**

Well locations identified on the driller's logs and corresponding driller's maps maintained by the TCEQ records. **Note:** The TCEQ implemented this procedure in 1991.

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

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## **Environmental Data Resources, Inc.**

## **Water Well Review**

Site Name: Commercial Metals Company Inquiry: 2083176.1

Site Address: 4614 Agnes St

City: Corpus Christi State: TX Zip: 78408

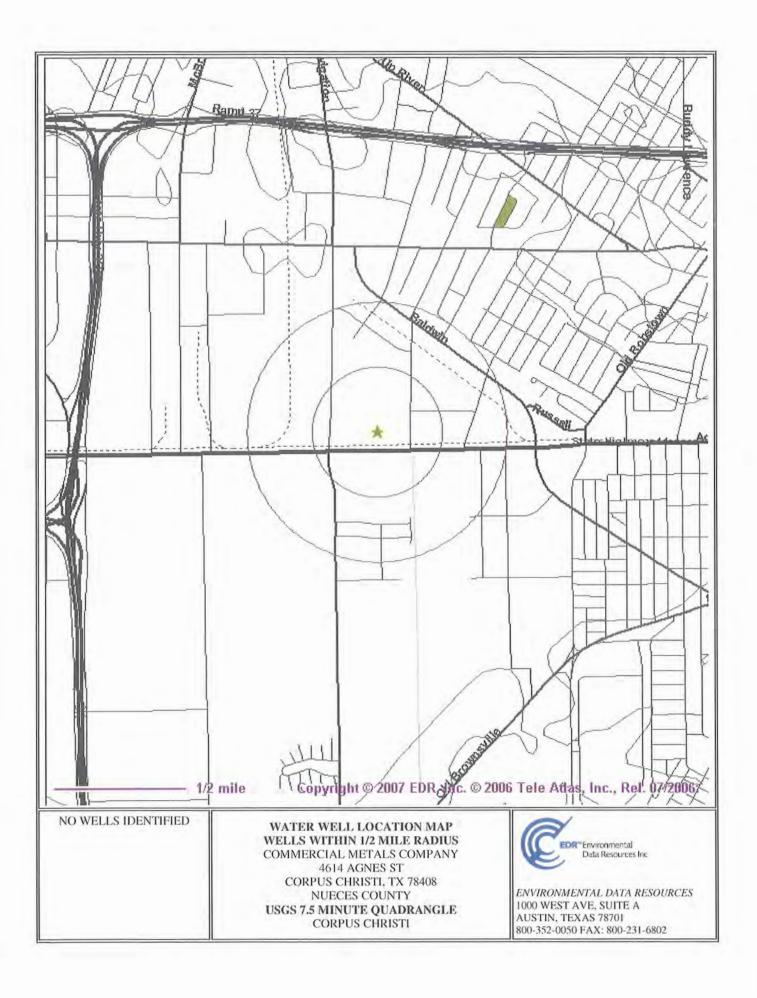
WELL CLASSIFICATION	NUMBER IDENTIFIED WITHIN AOR
LOCATED	0
PLOTTED	0
PARTIALLY NUMBERED	0
UNNUMBERED	0
TOTAL NUMBER IDENTIFIED	0

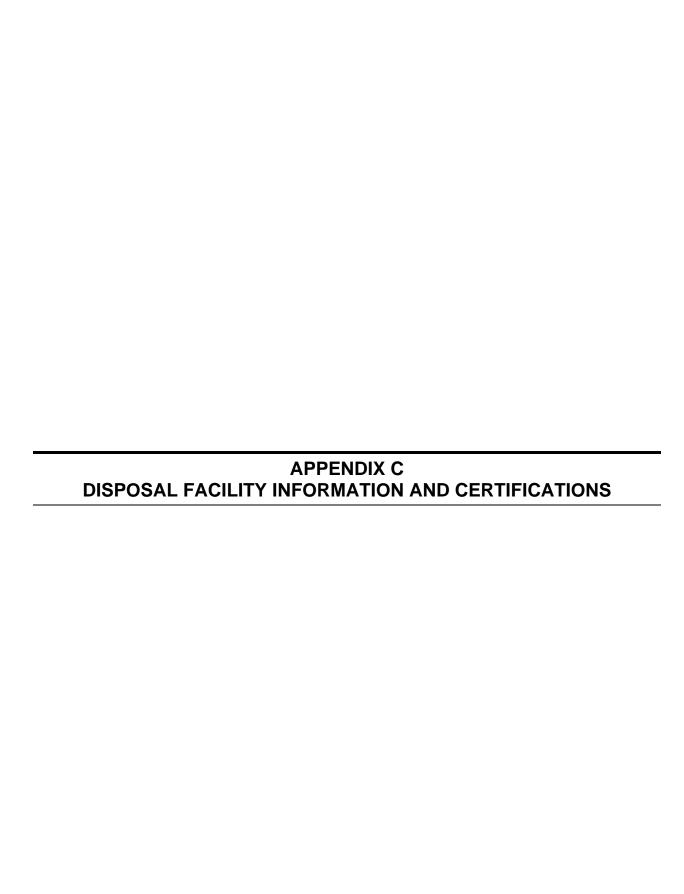
LOCATED WELLS: NO WELLS IDENTIFIED

PLOTTED WELLS: NO WELLS IDENTIFIED

PARTIALLY NUMBERED WELLS: NO WELLS IDENTIFIED

UNNUMBERED WELLS: NO WELLS IDENTIFIED





## **Disposal Facility Information and Certifications**

## Application for Risk Based Cleanup Commercial Metals Company - Corpus Christi

					Texas Landfill Registration
Name	Address	Point of Contact	Telephone	Waste Class	Permit Number
		Steven Brown or Sales Department			
CSC Disposal & Landfill	101 Republic Way, Avalon, TX 76623	cell: (254) 687-2511	(972) 627-3419	TSCA - PCBs only	SWR H0241*
		Todd Muenster			
		cell: (361) 947-3663			
		email: tmuenster@republicservices.com			
El Centro Landfills	3189 County Road 69, Robstown, TX	Special Waste Sales Rep	(361) 767-7905	Non-hazardous waste, will accept <50 parts per billion PCBs	SWR 2267*
		Kathy Purvis			
		phone: (575) 394-4300 x 187		TSCA wastes (>50 ppm PCBs) and RCRA Hazardous and Non-	EPA ID: TXD 988088464
Waste Control Specialists (WCS) Landfill	9998 West Highway 176, Andrews, TX 79714	email: kpurvis@wcstexas.com	(575) 394-4300	hazardous industrial solid waste	SWR 50358
		Tim Roach			USDOT #1504538
		cell: (972) 467-5572			EPA ID: TXR000076018
Environmental Evolutions (Potential Transporter)	4525 FM 892, Robstown, TX 78380	email: troach@env-evol.com	(866) 652-8738	Not applicable.	SWR: # 88021

<sup>\*</sup> No EPA ID Number



## **TEMPORARY MEASURES PLAN**

## Prepared for



6565 N MacArthur Blvd, Suite 800 Irving, Texas 75039

Prepared by

## **WESTON SOLUTIONS, INC.**

2705 Bee Caves Road, Suite 100 Austin, Texas 78746 512-651-7100 • Fax 512-651-7101

June 2011

W.O. No. 14160.001.004.0001.01



# **TABLE OF CONTENTS**

Sec	ction		Page
1.	PUR	RPOSE AND OVERVIEW	1-1
2.	GEN	NERAL SITE INFORMATION	2-1
3.	POL	LLUTANT SOURCES, DRAINAGE, AND TEMPORARY MEASURES	3-1
	3.1	POLLUTANT SOURCES	3-1
	3.2	DRAINAGE	3-1
	3.3	TEMPORARY MEASURES	3-2
	3.4	MITIGATION	3-3
4.	SEC	CURITY	4-1
	4.1	FENCING	4-1
	4.2	SIGNAGE (PERIMETER PCB LABELS)	4-1
AP	PENI	DIX A PHOTOLOG DIX B SILT FENCE INFORMATION DIX C INSPECTION FORM	

## **LIST OF FIGURES**

Figure 1 Site Location Map

Figure 2 Topographic Map

Figure 3 Silt Fence and Signage Locations

## LIST OF ACRONYMS

BMPs best management practices

CMC CMC Recycling

EPA Environmental Protection Agency

PCB polychlorinated biphenyl

WESTON Weston Solutions, Inc.

## 1. PURPOSE AND OVERVIEW

Weston Solutions, Inc (WESTON<sub>®</sub>) prepared this Temporary Measures Plan for the Commercial Metals Company (CMC), dba CMC Recycling, located at 4614 Agnes Street, Corpus Christi, Texas, as part of its risk-based disposal pursuant to 40 CFR 761.61(c). A Site Location Map is provided as Figure 1. In a 13 April 2011 letter, the Environmental Protection Agency (EPA) requested that a Temporary Measures Plan be developed to prevent any further off-site migration of polychlorinated biphenyls (PCBs) and necessary mitigation to prevent off-site PCB exposure (according to 40 CFR §761.61). This plan has been developed to 1) prevent any further off-site migration, 2) present mitigation to prevent off-site exposure, and 3) describe engineering controls such as fencing and signage.

The temporary measures set forth in this plan will be implemented until such time as the permanent remedial solution is constructed.

## 2. GENERAL SITE INFORMATION

Name: CMC Recycling

**Physical Address:** 4614 Agnes Street, Corpus Christi, Texas

**Type of Facility:** Metal Recycling Facility

Point Source Discharges to: City of Corpus Christi storm sewer system, thence to

Corpus Christi Bay

**Person Responsible for Storm** 

**Water Pollution Prevention:** Coulter James

**Phone Number:** (361) 884-4071

**Responsibilities:** 

Overseeing implementation of best management

practices (BMPs)

Conducting routine inspections

# 3. POLLUTANT SOURCES, DRAINAGE, AND TEMPORARY MEASURES

## 3.1 POLLUTANT SOURCES

PCBs were identified in on-site surface soils. CMC has not used the southwestern portion of the property (approximately 2 acres) for recycling activities. Sample results in the vicinity indicate that no PCBs have been reported above the detection limits, and it has been documented that there are no off-site impacts near this area. As such, stormwater from this portion of the property will not be targeted for temporary measures.

The CMC property contains a PCB impacted area currently covered by concrete. Additional temporary measures will not be targeted for this location, as the concrete cover provides an adequate temporary measure to prevent off-site migration.

This plan primarily addresses the northern area of the property. Surface soils in this area are impacted with PCBs.

#### 3.2 DRAINAGE

As shown in Figure 2, the entire facility is relatively flat, with about a 3 foot drop in elevation from north to south. A 3 foot crown on the north end of the property extends from the east to the west side of the property. The area to the north of the crown has not been impacted with PCBs; therefore stormwater runoff from this drainage area is not planned to be controlled with silt fencing. The area south of the crown drains to the west and south and will be controlled with silt fencing along the west side of the property, as indicated in Figures 2 and 3. There are two main outfall points on the west property line that discharge to off-property stormwater drainage ways. These drainage ways divert stormwater to the Corpus Christi stormwater collection system.

Along the lower portion of the property, where the property line turns straight west, there is a 1-foot decrease in grade changing back to a 2 foot rise on the far west property line. Each of the corners on the western property line tapers off towards Navigation Road. The south property line is mostly flat, with low point at approximately midway. The drainage along the east property line flows mostly to the west with a small drainage area that flows to the east. Photographs taken during site reconnaissance show the flat topography and are included in

## POLLUTANT SOURCES, DRAINAGE, AND TEMPORARY MEASURES

Appendix A. The two main stormwater discharge points on the western property line lead to offsite drainage ways as shown on Figure 3; *also see* Appendix A, Photograph 13.

## 3.3 TEMPORARY MEASURES

Temporary measures to be implemented at the site include engineering controls in conjunction with inspections to ensure that the controls are in good condition.

#### 3.3.1 ENGINEERING CONTROLS

The majority of impacted soils at the facility are covered by scrap/shredded metal, asphalt, concrete, or vegetation. The majority of the facility is surrounded by a vegetative strip that grows along the fence line. Photos of this are shown in Appendix A. The relatively flat nature of the site combined with the vegetative coverage helps to reduce the velocity of stormwater and settle suspended solids.

Silt fences will be installed at the locations shown in Figures 2 and 3 as a temporary measure to retain suspended solids on-site. The key areas the silt fence will control are the two main outfall points on the west property line that discharge to off-property stormwater drainage ways. In addition, each of the corners on the western property line will be controlled with silt fence. The south property line has one low area that will be controlled with silt fence. The east property line has a small drainage area that will be controlled with silt fence as well. Silt fence is not proposed for the far north end of the property. This area has dense grass and brush, and results from sampling efforts in this area have been reported with no detections of PCBs. The silt fence locations are based on the site inspection and a property elevation drawing that identified the most likely locations where significant stormwater flow exits the property. Silt fences will be installed in accordance with the installation instructions included in Appendix B.

#### 3.3.2 INSPECTIONS

The silt fences will be inspected once a month to ensure that they have not been damaged by vehicles or other equipment. The inspections will be documented using the inspection form in Appendix C, which will be maintained on-site for record keeping. Damaged silt fence will be repaired or replaced as necessary. Additionally, silt fences will be inspected to determine whether they are meeting effective treatment capacity. If sediments are mounded up to 1/3 of the

## POLLUTANT SOURCES, DRAINAGE, AND TEMPORARY MEASURES

height of the silt fence, the sediments will be removed. Sediments that are removed will be placed in containers and retained on-site. The contained sediment will be addressed with the final remedial solution, *i.e.*, placement under the cap.

#### 3.3.3 RECORD KEEPING

Records of the inspections will be maintained on-site up to and through the remediation period until the permanent stormwater plan is approved and implemented. Completed inspection forms will either be retained in Appendix C of this plan or in a designated file at the facility.

## 3.4 MITIGATION

Temporary measures related to mitigation of off-site impacts are not anticipated. Given that off-site areas have limited access and personnel are not in contact with these areas, exposure is not likely. Limited off-site impacts have been identified adjacent to the property line and will be addressed in the remedial solution for the site. If, however, it is determined through inspections that sediments have been transported off-site, these sediments will be removed, as described in Section 3.3.2.

## 4. SECURITY

#### 4.1 FENCING

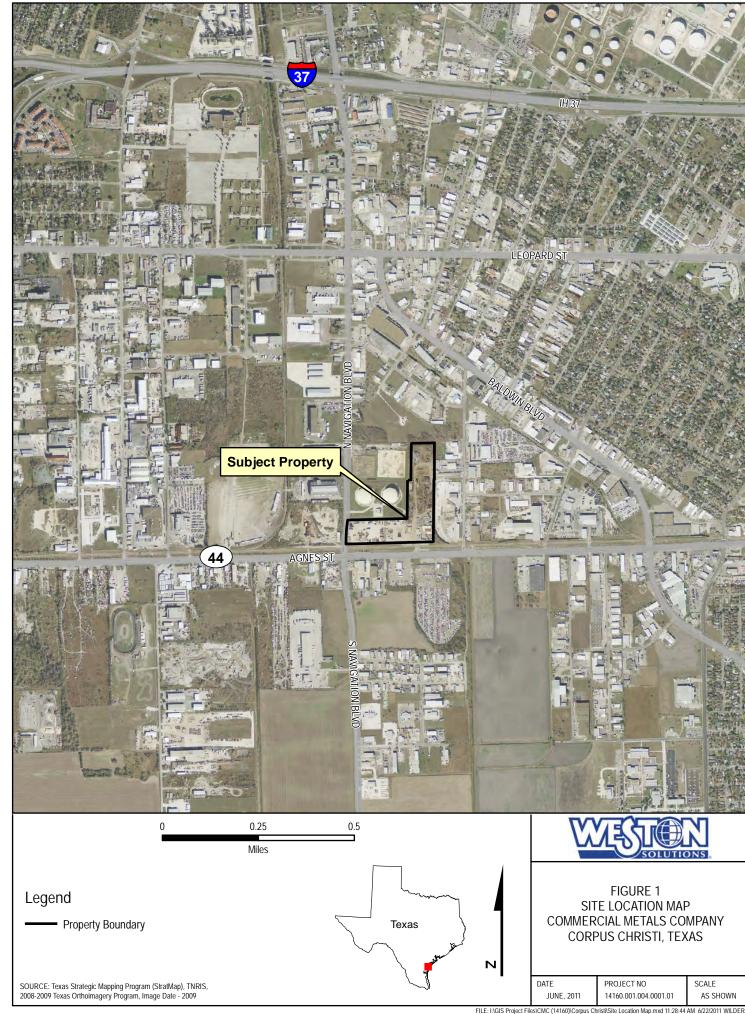
The CMC Recycling facility is fenced along the property boundary, with the exception of the north side of the property next to the Terminal Street area. Although this portion of the property is unfenced, practical considerations eliminate the need for a fence in this area. First, a line of dense vegetation and scrap metal at the north end of the property makes access from the north difficult, as shown in Appendix A, Photograph 9. Second, as seen in Figure 3, there are no roads or other open points of access to the northern boundary of the property. The lack of access, dense vegetation, and scrap metal effectively serve as a fence to discourage trespassers. Additionally, the immediate vicinity is used for commercial/industrial purposes only, reducing the potential for trespassers in the area.

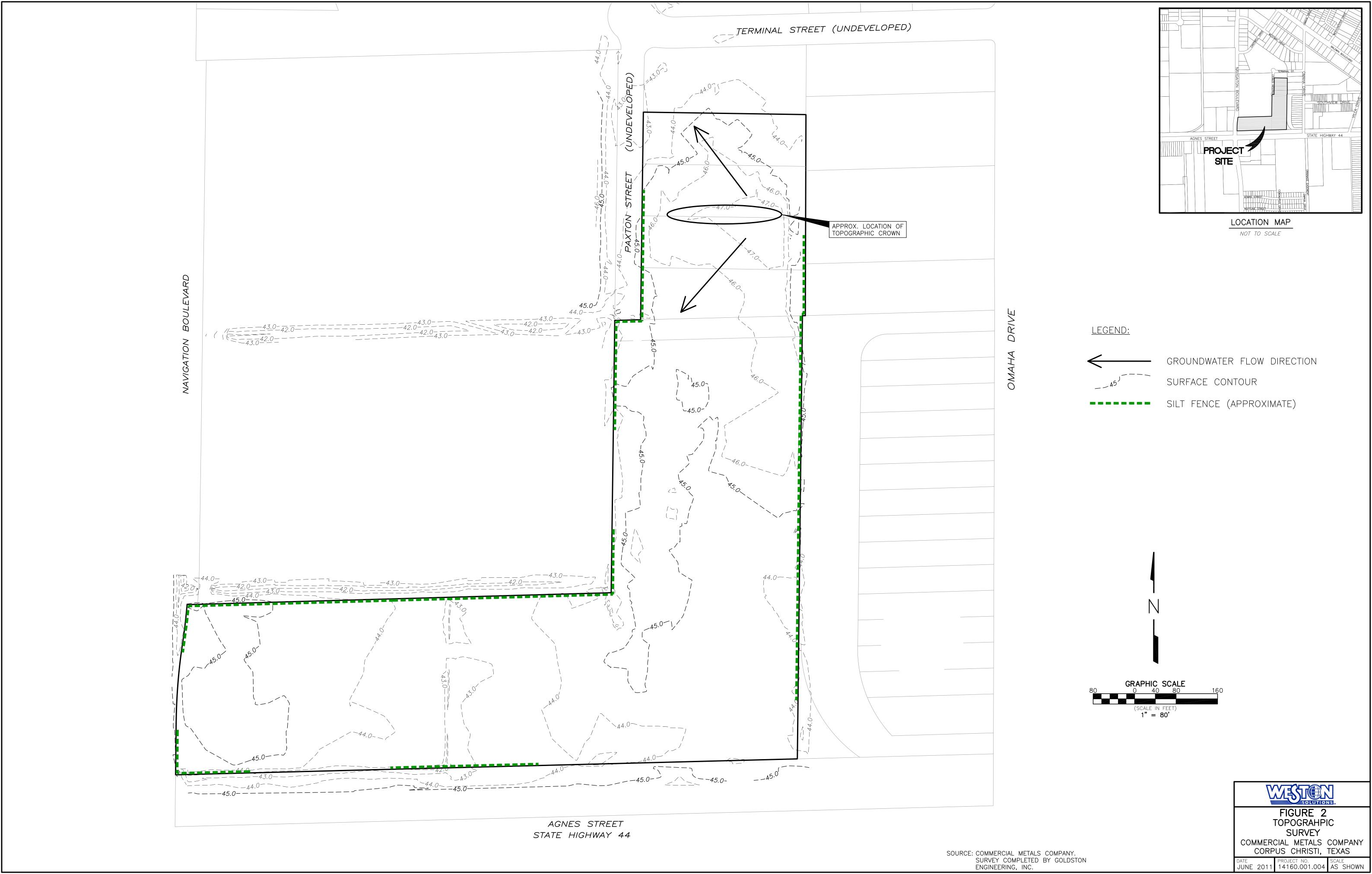
## 4.2 SIGNAGE (PERIMETER PCB LABELS)

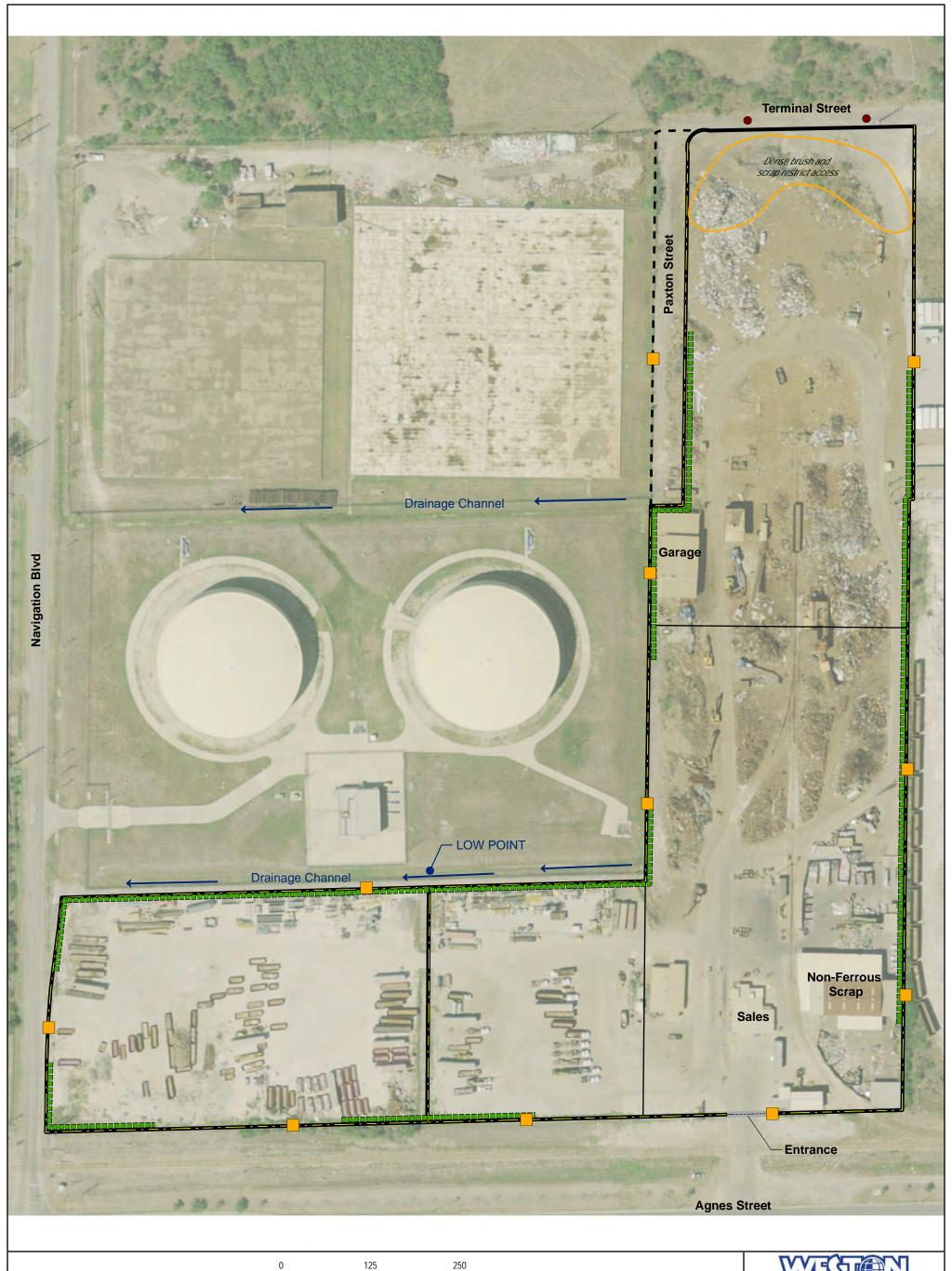
Labels will be placed around the perimeter of the facility to indicate that soils on the property are contaminated. (Appendix A contains an aerial map of the site showing the approximate locations where the labels will be placed around the perimeter. The numbers on the map correspond to the photographs immediately following the aerial map in Appendix A.) Specifically, the signs will be placed (1) on the exterior of the fence (Appendix A, Photographs 1-18), and (2) at the entrances to the facility (the main and emergency entrances) (Appendix A, Photograph 1). In addition to the signs on the perimeter of the fence and entrances, additional signs will be placed on posts at the north end of the property (Appendix A, Photographs 8-10). These locations were selected based on the most likely access points to the property based on off-site property use. An example of the label is shown below. The actual text of the label (6" X 6") will read: "Notice:













Legend

SOURCE: Globexplorer, 2009

Fence Post with Sign Location Sign Location

Silt Fence (Approximate)

 Paxton Street Boundary Entrance Gate Fence Line Property Boundary

Notes: 1. Stormwater discharge from the property is by sheet flow.

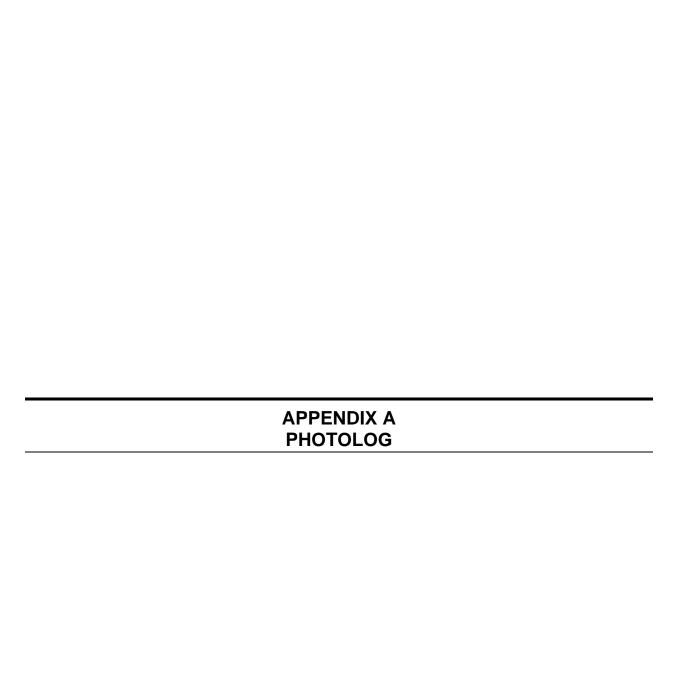
2. Vegetation along fence line will effectively reduce offsite sediment transport.

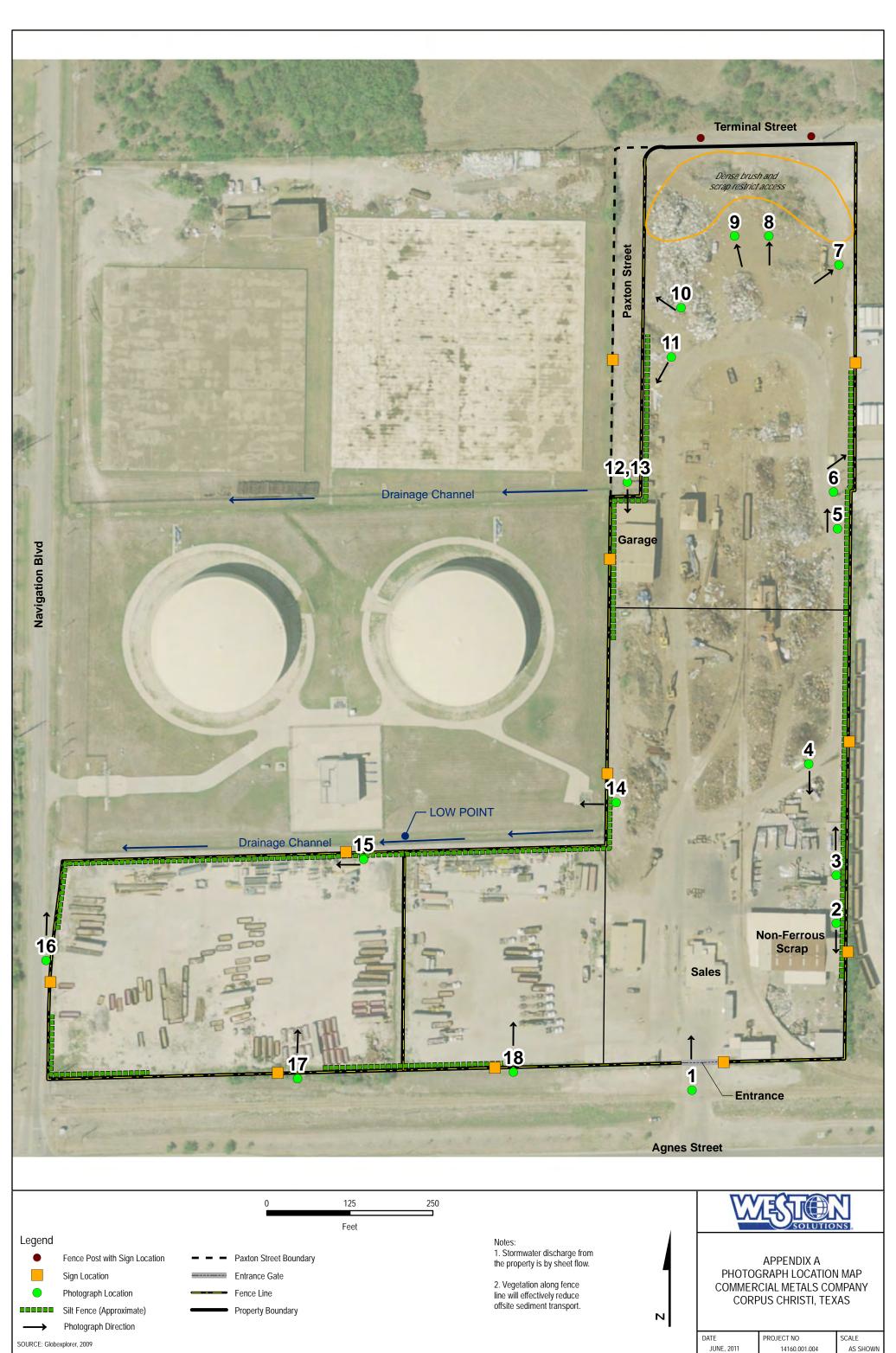


FIGURE 3 DRAINAGE, SILT FENCE, AND SIGNAGE LOCATIONS COMMERCIAL METALS COMPANY CORPUS CHRISTI, TEXAS

JUNE, 2011

PROJECT NO SCALE 14160.001.004





The following photographs correspond to the Appendix A Photograph Location Map (Arial view on the first page of Appendix A). The numbering scheme starts with Photograph No. 1 at the facility entrance on the southern portion of the property and moves counter clockwise around the parameter of the property.

# Photograph NO. 1

**Date:** 6/28/11

**Photo Direction:** N

Photo Description: Facility entrance

(southern property line).

**Topography Description:** Flat with mild slope toward facility (See Figure

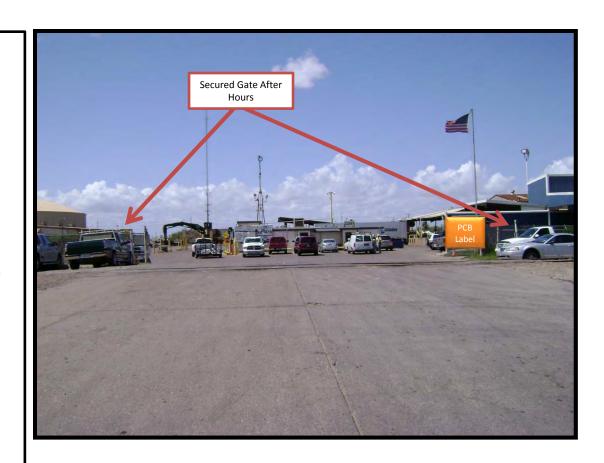
2).

Security Fence Description: Secured

gate after hours.

**Sign Description:** A PCB label (6"x 6") will be posted at the facility entrance (see Figure 3 for approximate

placement location).



**Date:** 5/11/11

**Photo Direction:** S

**Photo Description:** Southeastern

property fence line.

Topography Description: Flat (see

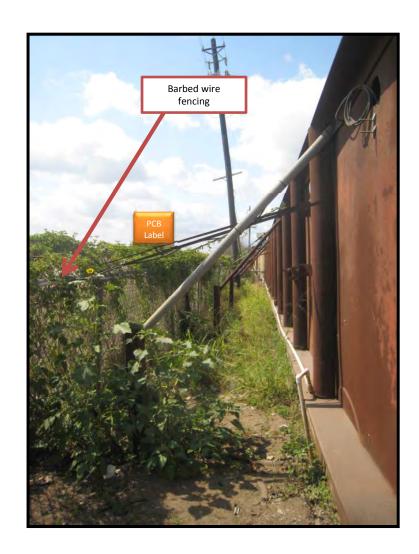
Figure 2).

**Security Fence Description:** Barbed

wire fencing.

**Sign Description:** A PCB label (6"x 6") will be posted on the outside fence line (see Figure 3 for approximate

placement location).



**Date:** 5/11/11

**Photo Direction:** N

**Photo Description:** Southeastern

property fence line.

**Topography Description:** Flat with minor slope to the southeast (see

Figure 2).

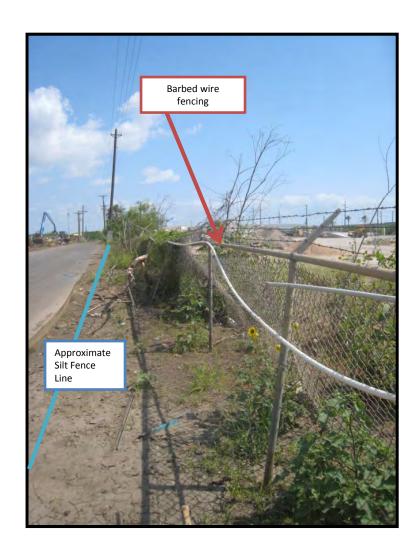
**Security Fence Description:** Barbed wire fencing (will be shored up at

implementation).

Silt Fencing Description: Silt fencing

as shown in Figure 2 and 3.

**Sign Description:** This photo is for fencing and topography illustration.



**Date:** 5/11/11

**Photo Direction:** S

**Photo Description:** Eastern property

fence line.

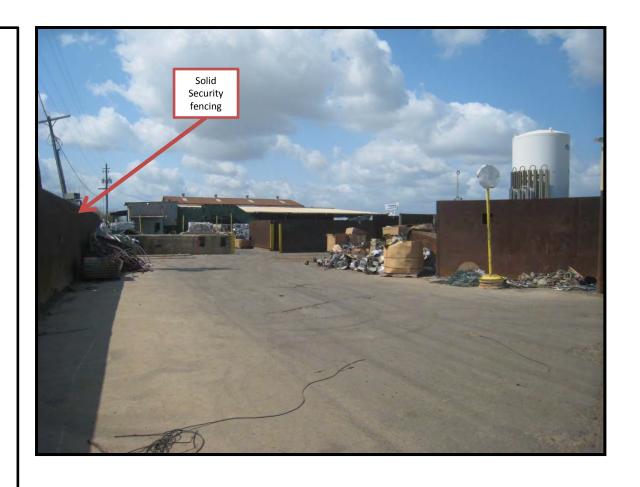
**Topography Description:** Flat with minor slope to the southeast (see

Figure 2).

**Security Fence Description:** Solid

security fencing.

**Sign Description:** This photo is for fencing and topography illustration.



**Date:** 5/11/11

**Photo Direction:** N

Photo Description: Eastern property

fence line.

**Topography Description:** Flat with minor slope to the northeast (see

Figure 2).

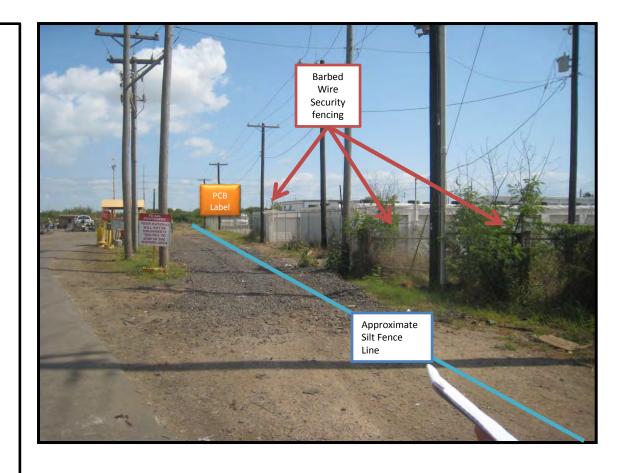
**Security Fence Description:** Barbed

wire security fencing.

**Silt Fencing Description:** Silt fencing as shown in Figure 2 and 3. Road provides some barrier between industrial activity and the fence line.

**Sign Description:** A PCB label (6"x 6") will be posted on the outside fence line (see Figure 3 for approximate

placement location).



**Date:** 5/11/11

**Photo Direction: E** 

**Photo Description:** Eastern property fence line. East of road. Material in background belongs to neighboring property owner (Ready Mix).

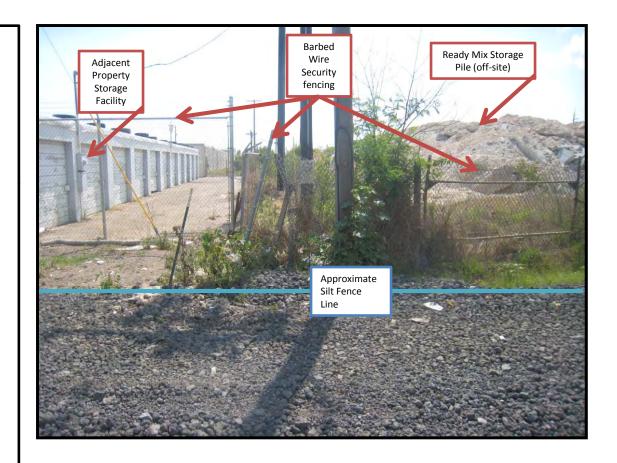
**Topography Description:** Flat with minor slope to the northeast (see

Figure 2).

**Security Fence Description:** Barbed wire security fencing (will be shored up at implementation).

**Silt Fencing Description:** Silt fencing as shown in Figure 2 and 3. Road provides some barrier between industrial activity and the fence line.

**Sign Description:** This photo is for fencing and topography illustration.



**Date:** 5/11/11

**Photo Direction: NE** 

**Photo Description:** Northeastern

property fence line.

**Topography Description:** Flat with minor slope to the northeast (see

Figure 2)

**Security Fence Description:** Barbed

wire security fencing.

**Sign Description:** This photo is for fencing and topography illustration.



**Date:** 6/28/11

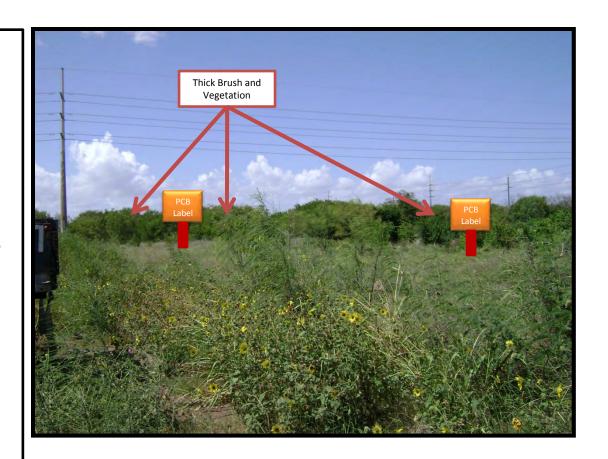
**Photo Direction:** N

**Photo Description:** North end of property (beyond work area).

**Topography Description:** Flat with minor slope to the northeast or northwest from center of property (see Figure 2).

**Security Fence Description:** Access is limited from the north due to thick brush and vegetation.

**Sign Description:** PCB labels (6"x 6") will be posted on fence posts near northern property line (see Figure 3 for approximate placement location).



**Date:** 6/28/11

**Photo Direction: NW** 

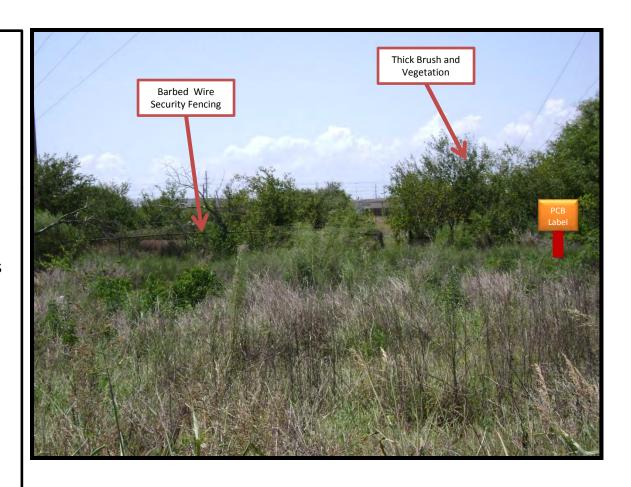
**Photo Description:** North end of property (beyond work area).

**Topography Description:** Flat with minor slope to the northwest (see

Figure 2).

**Security Fence Description:** Barbed wire security fencing along western portion of property boundary. Access is limited from the north due to thick brush and vegetation.

**Sign Description:** A PCB label (6"x 6") will be posted on a fence post near northern property line (see Figure 3 for approximate placement location).



**Date:** 5/11/11

**Photo Direction: NW** 

**Photo Description:** Northwestern

property fence line.

**Topography Description:** Flat with minor slope to the northwest (see

Figure 2).

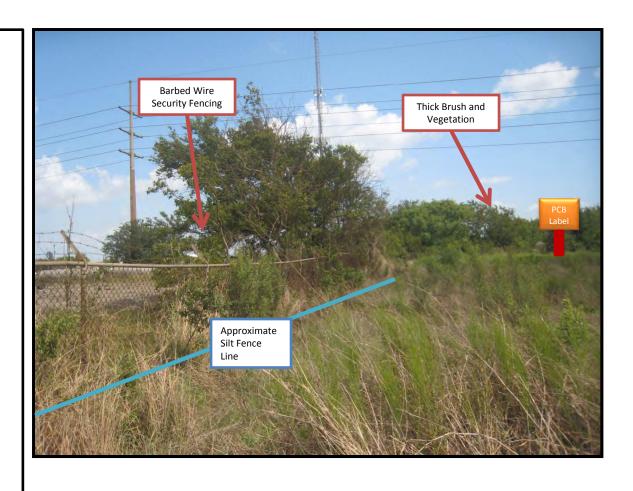
**Security Fence Description:** Barbed wire security fencing along western

portion of site.

Silt Fencing Description: Silt fencing

as shown in Figures 2 and 3.

**Sign Description:** A PCB label (6"x 6") will be posted on a fence post near northern property line (see Figure 3 for approximate placement location).



**Date:** 5/11/11

**Photo Direction: SW** 

**Photo Description:** northwestern

property fence line.

**Topography Description:** Flat with minor slope to the west (see Figure 2).

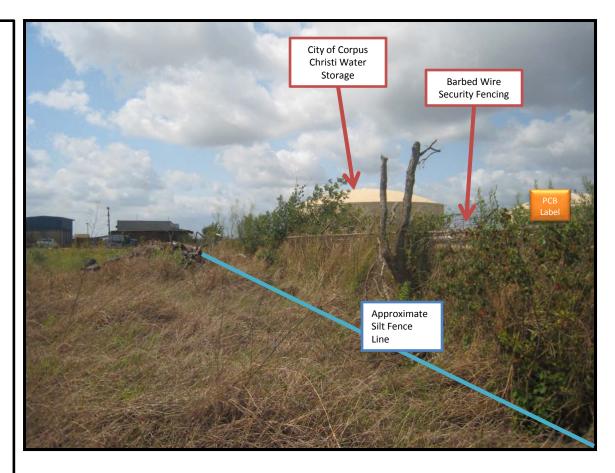
**Security Fence Description:** Barbed wire security fencing along western

portion of site.

**Silt Fencing Description:** Silt fencing

as shown in Figures 2 and 3.

**Sign Description:** A PCB label (6"x 6") will be posted on the outside fence line (see Figure 3 for approximate



**Date:** 5/11/11

**Photo Direction:** S

Photo Description: Western property

fence line behind building.

**Topography Description:** Flat with minor slope to the west (see Figure 2).

**Security Fence Description:** Barbed wire security fencing along western

portion of site.

Silt Fencing Description: Silt fencing

as shown in Figure 2 and 3.

**Sign Description:** A PCB label (6"x 6") will be posted on the outside fence line (see Figure 3 for approximate



**Date:** 5/11/11

**Photo Direction: SW** 

**Photo Description:** Western property fence line. Location where stormwater leaves the property to the off-site drainage channel visible in the

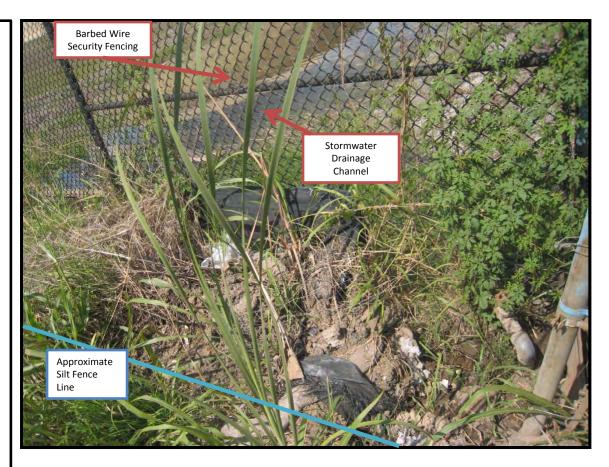
background.

**Topography Description:** Flat with minor slope to the west (see Figure 2).

**Security Fence Description:** Barbed wire security fencing along western portion of site.

**Silt Fencing Description:** Silt fencing as shown in Figures 2 and 3.

**Sign Description:** This photo is for fencing and topography illustration. The water in the drainage channel is the result of the City of Corpus Christi emptying one of the below ground water storage tanks at the time this photo was taken. This drainage channel is normally dry.



**Date:** 5/11/11

**Photo Direction:** W

Photo Description: Western property

fence line.

**Topography Description:** Flat with minor slope to the west (see Figure 2).

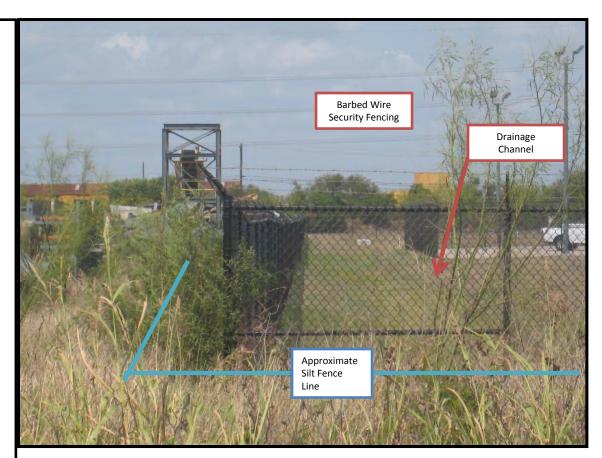
**Security Fence Description:** Barbed wire security fencing along western

portion of site.

**Silt Fencing Description:** Silt fencing

as shown in Figure 2 and 3.

**Sign Description:** This photo is for fencing and topography illustration.



**Date:** 5/11/11

**Photo Direction:** W

**Photo Description:** Western property

fence line.

**Topography Description:** Flat with minor slope to the west (see Figure 2).

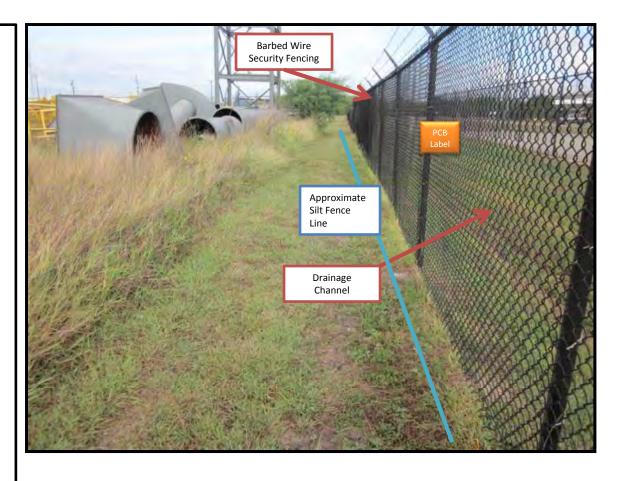
**Security Fence Description:** Barbed wire security fencing along western

portion of site.

**Silt Fencing Description:** Silt fencing

as shown in Figures 2 and 3.

**Sign Description:** A PCB label (6"x 6") will be posted on the outside fence line (see Figure 3 for approximate



**Date:** 6/28/11

**Photo Direction: NE** 

**Photo Description:** Western property fence line along Navigation Blvd showing the location of the emergency

entrance/exit.

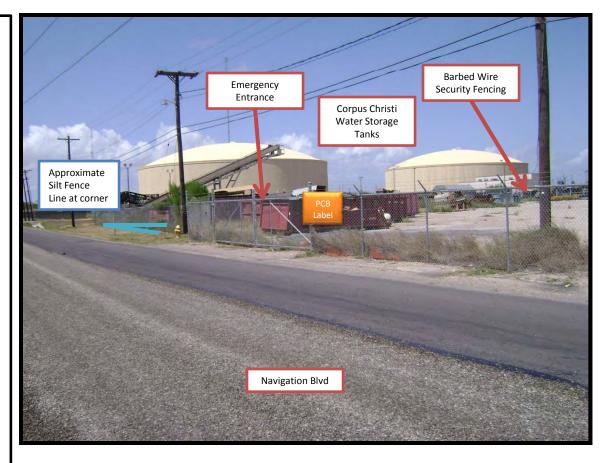
**Topography Description:** Flat with minor slope to the north and east (see Figure 2).

**Security Fence Description:** Barbed wire security fencing along western portion of site.

Silt Fencing Description: Silt fencing

as shown in Figures 2 and 3.

**Sign Description:** A PCB label (6"x 6") will be posted on the outside fence line (see Figure 3 for approximate



**Date:** 5/11/11

**Photo Direction:** N

**Photo Description:** Southern property

fence line along Agnes St.

**Topography Description:** Flat with minor slope to the north on-site (see

Figure 2).

**Security Fence Description:** Barbed wire security fencing along southern

portion of site.

**Sign Description:** A PCB label (6"x 6") will be posted on the outside fence line (see Figure 3 for approximate



**Date:** 5/11/11

**Photo Direction:** N

**Photo Description:** Southern property

fence line along Agnes St.

**Topography Description:** Flat with minor slope to the east on-site (see

Figure 2).

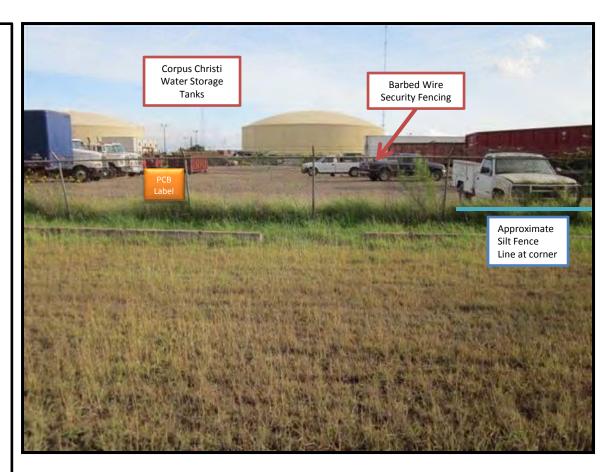
**Security Fence Description:** Barbed wire security fencing along southern

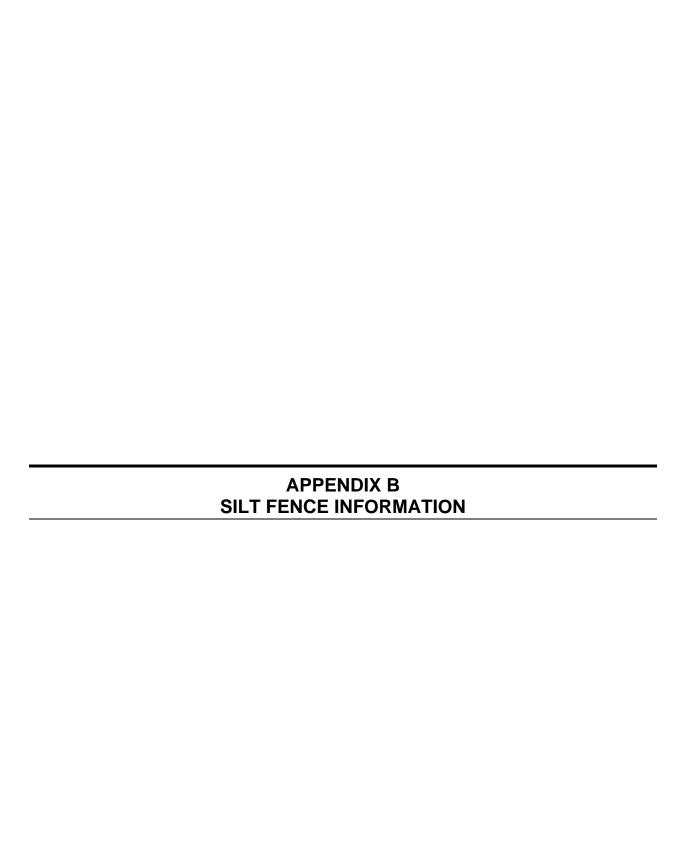
portion of site.

Silt Fencing Description: Silt fencing

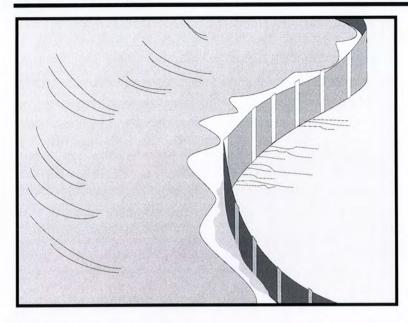
as shown in Figures 2 and 3.

**Sign Description:** A PCB label (6"x 6") will be posted on the outside fence line (see Figure 3 for approximate





Silt Fence SE-1



#### **Objectives**

EC	Erosion Control	
SE	Sediment Control	$\checkmark$
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
Waste Management and		

Materials Pollution Control

#### Legend:

$\checkmark$	Primary	Objective
_		

## ■ Secondary Objective

#### **Description and Purpose**

A silt fence is made of a filter fabric that has been entrenched, attached to supporting poles, and sometimes backed by a plastic or wire mesh for support. The silt fence detains sediment-laden water, promoting sedimentation behind the fence.

#### **Suitable Applications**

Silt fences are suitable for perimeter control, placed below areas where sheet flows discharge from the site. They should also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion. Silt fences are generally ineffective in locations where the flow is concentrated and are only applicable for sheet or overland flows. Silt fences are most effective when used in combination with erosion controls. Suitable applications include:

- Along the perimeter of a project.
- Below the toe or down slope of exposed and erodible slopes.
- Along streams and channels.
- Around temporary spoil areas and stockpiles.
- Below other small cleared areas.

#### Limitations

Do not use in streams, channels, drain inlets, or anywhere flow is concentrated.

#### **Targeted Constituents**

 $\square$ Sediment **Nutrients** Trash Metals Bacteria Oil and Grease

**Organics** 

#### **Potential Alternatives**

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-9 Straw Bale Barrier



SE-1 Silt Fence

- Do not use in locations where ponded water may cause flooding.
- Do not place fence on a slope, or across any contour line. If not installed at the same elevation throughout, silt fences will create erosion.
- Filter fences will create a temporary sedimentation pond on the upstream side of the fence and may cause temporary flooding. Fences not constructed on a level contour will be overtopped by concentrated flow resulting in failure of the filter fence.
- Improperly installed fences are subject to failure from undercutting, overlapping, or collapsing.
  - Not effective unless trenched and keyed in.
  - Not intended for use as mid-slope protection on slopes greater than 4:1 (H:V).
  - Do not allow water depth to exceed 1.5 ft at any point.

#### **Implementation**

#### General

A silt fence is a temporary sediment barrier consisting of filter fabric stretched across and attached to supporting posts, entrenched, and, depending upon the strength of fabric used, supported with plastic or wire mesh fence. Silt fences trap sediment by intercepting and detaining small amounts of sediment-laden runoff from disturbed areas in order to promote sedimentation behind the fence.

Silt fences are preferable to straw bale barriers in many cases. Laboratory work at the Virginia Highway and Transportation Research Council has shown that silt fences can trap a much higher percentage of suspended sediments than can straw bales. While the failure rate of silt fences is lower than that of straw bale barriers, there are many instances where silt fences have been improperly installed. The following layout and installation guidance can improve performance and should be followed:

- Use principally in areas where sheet flow occurs.
- Don't use in streams, channels, or anywhere flow is concentrated. Don't use silt fences to divert flow.
- Don't use below slopes subject to creep, slumping, or landslides.
- Select filter fabric that retains 85% of soil by weight, based on sieve analysis, but that is not finer than an equivalent opening size of 70.
- Install along a level contour, so water does not pond more than 1.5 ft at any point along the silt fence.
- The maximum length of slope draining to any point along the silt fence should be 200 ft or less
- The maximum slope perpendicular to the fence line should be 1:1.

Silt Fence SE-1

Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 ft² of ponding area should be provided for every acre draining to the fence.

- Turn the ends of the filter fence uphill to prevent stormwater from flowing around the fence.
- Leave an undisturbed or stabilized area immediately down slope from the fence where feasible.
- Silt fences should remain in place until the disturbed area is permanently stabilized.

#### Design and Layout

Selection of a filter fabric is based on soil conditions at the construction site (which affect the equivalent opening size (EOS) fabric specification) and characteristics of the support fence (which affect the choice of tensile strength). The designer should specify a filter fabric that retains the soil found on the construction site yet that it has openings large enough to permit drainage and prevent clogging. The following criteria is recommended for selection of the equivalent opening size:

- If 50 percent or less of the soil, by weight, will pass the U.S. Standard Sieve No. 200, select the EOS to retain 85 % of the soil. The EOS should not be finer than EOS 70.
- For all other soil types, the EOS should be no larger than the openings in the U.S. Standard Sieve No. 70 except where direct discharge to a stream, lake, or wetland will occur, then the EOS should be no larger than Standard Sieve No. 100.

To reduce the chance of clogging, it is preferable to specify a fabric with openings as large as allowed by the criteria. No fabric should be specified with an EOS smaller than U.S. Standard Sieve No. 100. If 85% or more of a soil, by weight, passes through the openings in a No. 200 sieve, filter fabric should not be used. Most of the particles in such a soil would not be retained if the EOS was too large and they would clog the fabric quickly if the EOS were small enough to capture the soil.

The fence should be supported by a plastic or wire mesh if the fabric selected does not have sufficient strength and bursting strength characteristics for the planned application (as recommended by the fabric manufacturer). Filter fabric material should contain ultraviolet inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0 °F to 120 °F.

- Layout in accordance with attached figures.
- For slopes steeper than 2:1 (H:V) and that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to install additional protection immediately adjacent to the bottom of the slope, prior to installing silt fence. Additional protection may be a chain link fence or a cable fence.
- For slopes adjacent to sensitive receiving waters or Environmentally Sensitive Areas (ESAs), silt fence should be used in conjunction with erosion control BMPs.

SE-1 Silt Fence

#### Materials

- Silt fence fabric should be woven polypropylene with a minimum width of 36 in. and a minimum tensile strength of 100 lb force. The fabric should conform to the requirements in ASTM designation D4632 and should have an integral reinforcement layer. The reinforcement layer should be a polypropylene, or equivalent, net provided by the manufacturer. The permittivity of the fabric should be between 0.1 sec<sup>-1</sup> and 0.15 sec<sup>-1</sup> in conformance with the requirements in ASTM designation D4491.
- Wood stakes should be commercial quality lumber of the size and shape shown on the plans.
   Each stake should be free from decay, splits or cracks longer than the thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.
- Staples used to fasten the fence fabric to the stakes should be not less than 1.75 in. long and should be fabricated from 15 gauge or heavier wire. The wire used to fasten the tops of the stakes together when joining two sections of fence should be 9 gauge or heavier wire. Galvanizing of the fastening wire will not be required.
- There are new products that may use prefabricated plastic holders for the silt fence and use bar reinforcement instead of wood stakes. If bar reinforcement is used in lieu of wood stakes, use number four or greater bar. Provide end protection for any exposed bar reinforcement.

#### Installation Guidelines

Silt fences are to be constructed on a level contour. Sufficient area should exist behind the fence for ponding to occur without flooding or overtopping the fence.

- A trench should be excavated approximately 6 in. wide and 6 in. deep along the line the proposed silt fence.
- Bottom of the silt fence should be keyed-in a minimum of 12 in.
- Posts should be spaced a maximum of 6 ft apart and driven securely into the ground a minimum of 18 in. or 12 in. below the bottom of the trench.
- When standard strength filter fabric is used, a plastic or wire mesh support fence should be fastened securely to the upslope side of posts using heavy—duty wire staples at least 1 in. long. The mesh should extend into the trench. When extra-strength filter fabric and closer post spacing are used, the mesh support fence may be eliminated. Filter fabric should be purchased in a long roll, and then cut to the length of the barrier. When joints are necessary, filter cloth should be spliced together only at a support post, with a minimum 6 in. overlap and both ends securely fastened to the post.
- The trench should be backfilled with compacted native material.
- Construct silt fences with a setback of at least 3 ft from the toe of a slope. Where a silt fence is determined to be not practicable due to specific site conditions, the silt fence may be constructed at the toe of the slope, but should be constructed as far from the toe of the slope as practicable. Silt fences close to the toe of the slope will be less effective and difficult to maintain.

Silt Fence SE-1

 Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the barrier; in no case should the reach exceed 500 ft.

#### Costs

Average annual cost for installation and maintenance (assumes 6 month useful life): \$7 per lineal foot (\$850 per drainage acre). Range of cost is \$3.50 - \$9.10 per lineal foot.

#### **Inspection and Maintenance**

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Repair undercut silt fences.
- Repair or replace split, torn, slumping, or weathered fabric. The lifespan of silt fence fabric is generally 5 to 8 months.
- Silt fences that are damaged and become unsuitable for the intended purpose should be removed from the site of work, disposed of, and replaced with new silt fence barriers.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.
- Silt fences should be left in place until the upstream area is permanently stabilized. Until
  then, the silt fence must be inspected and maintained.
- Holes, depressions, or other ground disturbance caused by the removal of the silt fences should be backfilled and repaired.

#### References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group-Working Paper, USEPA, April 1992.

Sedimentation and Erosion Control Practices, and Inventory of Current Practices (Draft), UESPA, 1990.

Southeastern Wisconsin Regional Planning Commission (SWRPC). Costs of Urban Nonpoint Source Water Pollution Control Measures. Technical Report No. 31. Southeastern Wisconsin Regional Planning Commission, Waukesha, WI. 1991

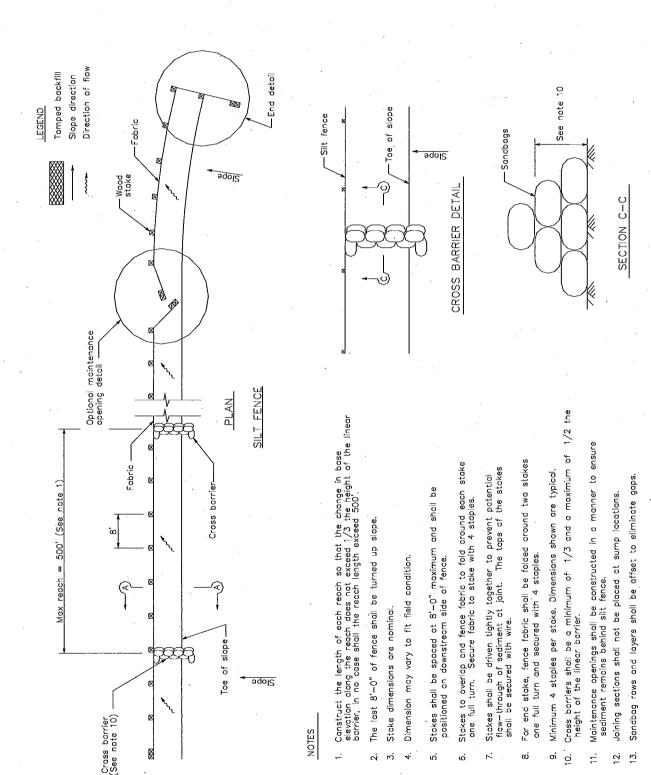
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

SE-1 Silt Fence

Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

U.S. Environmental Protection Agency (USEPA). Stormwater Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

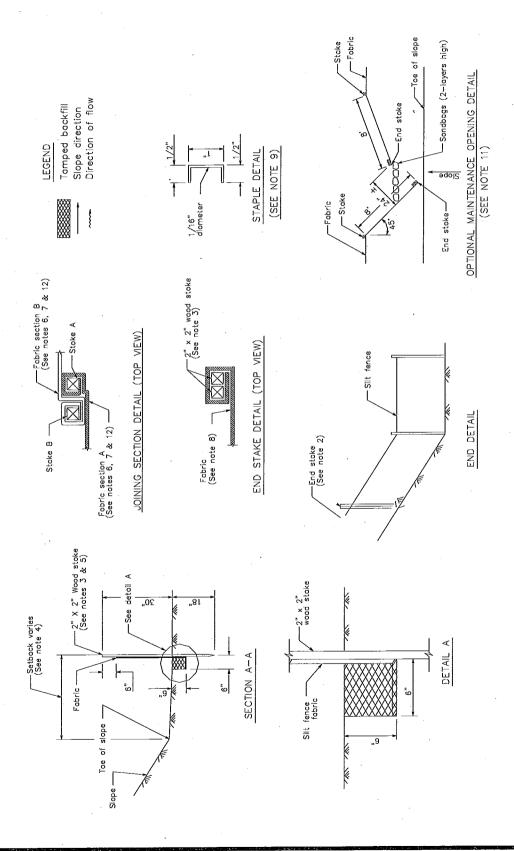


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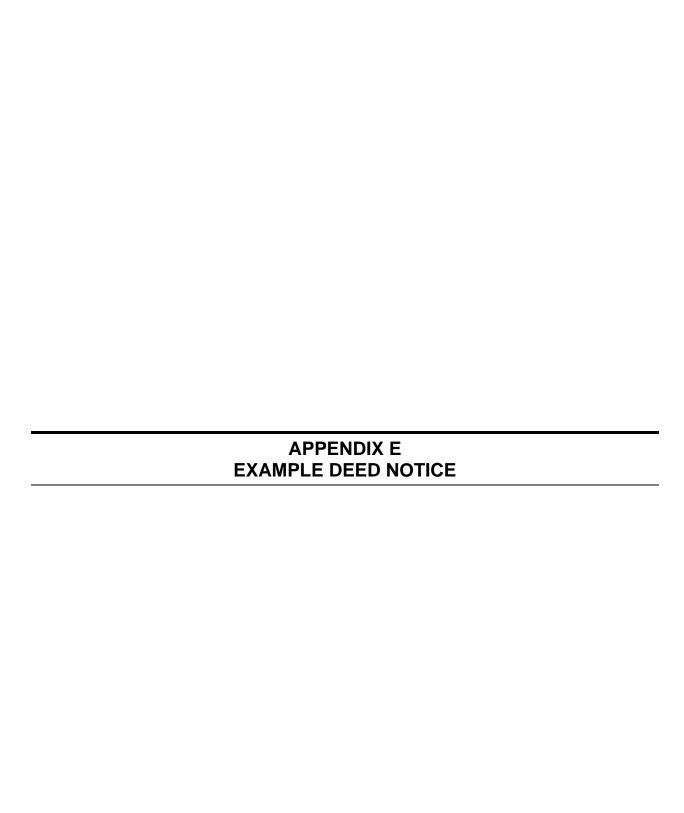
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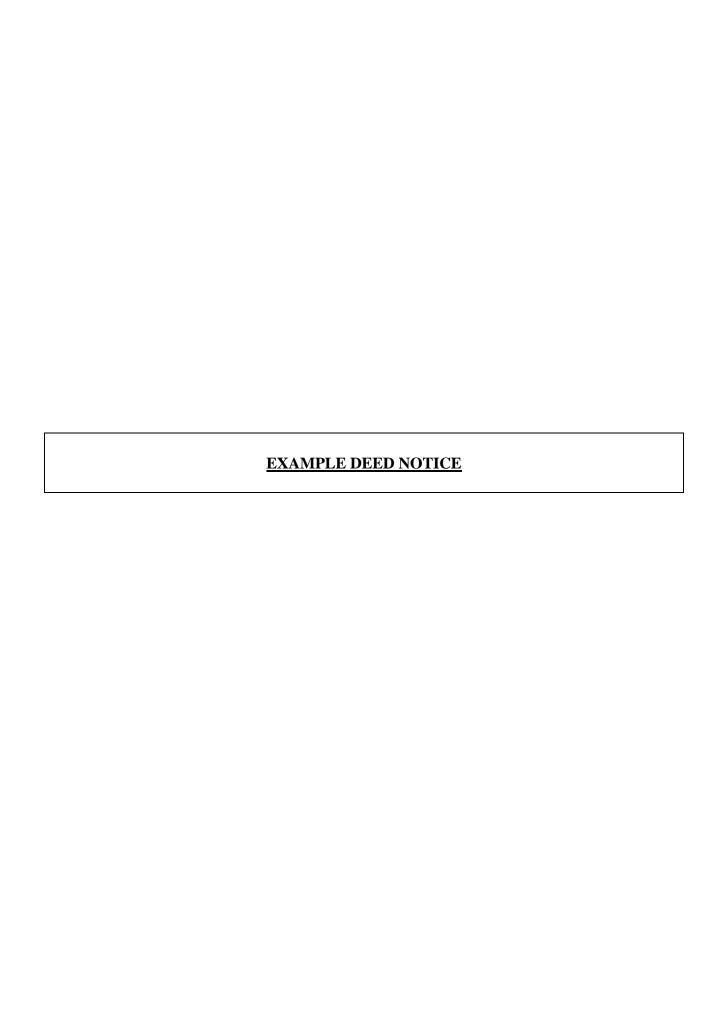




### CMC Corpus Christi Monthly Inspection Form

Date:		Inspector				
Inspection Item	Answer (Y/N)	Comments	Corrective Action?			
Silt Fences						
Are silt fences in good condition?						
Has silt accumulated more than 1/3 up the side of the fence?						
Roads						
Evidence of sediment transported off-site after a rain event?						
Fenceline						
Fence in good physical condition?						
Visual signs of sediment transport outside the fence?						
Signage						
All signs are present?						
Signs are in good condition and clearly visible?						
I certify that all items requiring of	corrective a	action have been corrected b	by the date listed below.			
Date			-			
		Inspector	<del></del>			





## MODEL INSTITUTIONAL CONTROL RESTRICTIVE COVENANT

#### Commercial Metals Company, Corpus Christi Facility 4614 Agnes Street Corpus Christi, Nueces County, Texas 78405

STATE OF TEXAS

COUNTY OF Nueces

This Notice is filed to provide information concerning certain environmental conditions and/or use limitations pursuant to the Texas Commission on Environmental Quality (TCEQ) Texas Risk Reduction Program Rule (TRRP) found at 30 Texas Administrative Code (TAC), Chapter 350 and Environmental Protection Agency (EPA) 40 CFR §761.61, and affects the real property (Property) described as follows:

[Insert legal description or a reference to an attached Exhibit A with the phrase, "attached hereto and incorporated herein by reference." This legal description needs to include the entire recorded tract of land held by the owner executing this deed notice. The description should consist of the property description used in the last recorded vesting deed covering the Property or, if the Property has since been subdivided, the legal description for the subdivision with reference to the recorded plat map thereof (where the vesting deed covered multiple lots, tracts, or parcels of land, only the lot(s), tract(s), or parcel(s) containing the identified chemicals of concern would need to be included.) This is not a legal description of the Affected Property as set forth below. If the Affected Property (as set forth below) that is being made subject to the deed notice impacts the land of more than one owner, a separate deed notice needs to be filed for each tract.]

Portions of the *soils and groundwater* of the Property contain certain identified chemicals of concern causing those portions of the Property to be considered an Affected Property as that term is defined in the TRRP. The portion considered to be Affected Property is described as follows:

[Insert legal description and reference to an attached Exhibit B, with the phrase, "attached hereto and incorporated herein by reference." Exhibit B needs to include a metes and bounds description of the Affected Property and a plat map clearly demarcating the portions of the Property that contain the Affected Property. The map must contain a north arrow, a correlating map scale, and a legend identifying any used symbols or abbreviations. The metes and bounds description and plat map must be accompanied by a certification from a registered professional land surveyor so registered by the Texas Board of Professional Surveying attesting to the accuracy of the descriptions. Also, list each COC by environmental medium that exceeds the critical PCL.]

This Notice is required for the following reasons:

The Property shall not be used for any purposes other than commercial/industrial uses, as defined in 30 Texas Administrative Code, Chapter 350, Section 350.4(a)(13).

The Affected Property is subject to the TRRP requirements for properties containing concentrations of chemicals of concern in soil and is subject to the requirements in 30 TAC §350.33(e)(2) and 40 CFR §761.61 to prevent exposure to soils that contain chemicals of concern in excess of the protective concentration level. The attached Exhibit B describes and provides the location of the physical control and the extent of the soil that exceeds the TCEQ-approved protective concentration levels for certain chemicals of concern. The attached Exhibit B also describes the required maintenance and monitoring required for the physical control. This program must be implemented unless and until TCEQ approves any modification. This deed notice must not be removed or modified without prior approval from TCEQ and EPA.

The Affected Property is subject to the TRRP requirements for properties with an area overlying a TCEQ-approved plume management zone. A plume management zone is defined as an area of groundwater-containing concentrations of chemicals of concern exceeding the TCEQ-approved protective concentration levels for the site, plus any additional area allowed by TCEQ in accordance with 30 TAC §350.33(f)(4). The undersigned has established a plume management zone so that the chemicals of concern in the groundwater are managed such that human exposure is prevented and that other groundwater resources are protected. The attached Exhibit B provides the location and extent of the plume management zone and describes the maintenance and monitoring required. This maintenance and monitoring is required until TCEQ approves some modification of those requirements. Exposure to groundwater within the plume management zone for any purpose is not advised until such time when all of chemicals of concern no longer exceed their respective protective concentration levels. This deed notice [and the physical control] must not be removed or modified without prior approval from TCEQ and EPA.

Groundwater wells may not be installed in the first groundwater-bearing zone within the Plume Management Area for extraction of groundwater, and no groundwater may be pumped from the first groundwater-bearing zone for any residential or non-residential use with the exception of pumping in order to achieve response action goals.

The site is being used for disposal of PCB remediation waste with a maximum PCB concentration of 500 mg/kg beneath the physical control and surrounded by a fence.

As of the date of this Notice, the record owner of fee title to the Property is CMC Americas, with an address of:

CMC Americas 1 Steel Mill Drive Seguin, Texas 78155

For additional information, contact:

TCEQ Central Records 12100 Park 35 Circle, Building E Austin, Texas 78753 Mail: TCEQ - MC 199 P O Box 13087 Austin, Texas 78711-3087

TCEQ Program and Identifier No.: VCP 222

This Notice may be rendered of no further force or effect only by a superseding deed notice executed by the TCEQ or its successor agencies and filed in the same Real Property Records as those in which this Deed Notice is filed.

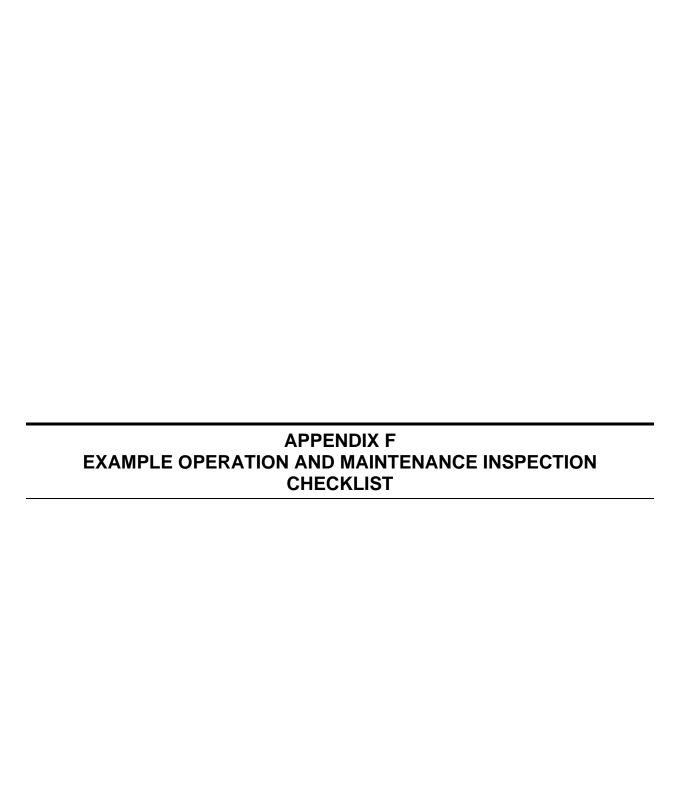
Executed this	day of	·
		CMC Americas
		By:
		Name:
		Title:
Executed this	day of	,·
		LAND OWNER
		By:
		Name:
		Title:
Accepted as Third I	Party Beneficiary	thisday of
STATE OF TEXAS NUECES COUNTY		
BEFORE M	ME, on this the [nam	day of, personally appeared, nell,, fittle, of CMC Americas known to me
to be the person who	ose name is subsc	cribed to the foregoing instrument, and they acknowledged to me that ses and consideration therein expressed.
GIVEN UNDER M	Y HAND AND S	SEAL OF OFFICE, this the day of,
		Notary Public in and for the State of Texas,
		County of Nucces
		My Commission Expires:

#### EXHIBIT A

## LEGAL DESCRIPTION OF 4614 Agnes Street, Corpus Christi, Texas

#### EXHIBIT B

Metes and Bounds Description of Affected Property



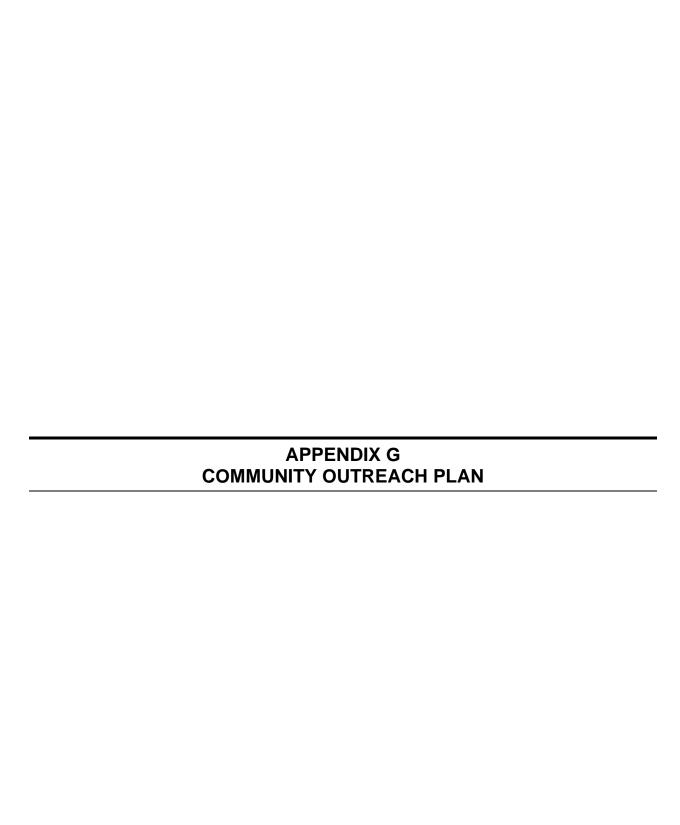
#### **EXAMPLE**

## CAP INSPECTION FORM

Site Name:			Permit No.:		
Weather:			Inspection Date:		
Reviewed by:			Inspecto	or (Print):	
Site Map Attached: Yes No			Signatur	re:	
Location-Inspection Criteria	Yes	No	N/A	Comments	
GENERAL SITE					
1. Security Fencing/Gate					
a. Evidence of deterioration					
b. Signs of unauthorized entry					
c. Warning signs not properly posted					
2. Evidence of unauthorized dumping					
CAP	•	•	•		
1. Evidence of settlement/ponding					
2. Evidence of erosion or exposed wastes					
3. Evidence of cracking					
4. Evidence of burrowing animals					
7. Vegetation adequate					
GROUNDWATER MONITORING WELLS					
Deteriorating, damaged, or missing concrete pads or guard posts					
2. Damaged or deteriorating well pipe					
3. Deteriorating, damaged, or missing protective casings or locks					
4. Deteriorating, damaged, or missing well caps					
5. Deteriorating well labels.					
SURFACE WATER SYSTEMS	•	•			
1. Deterioration/Erosion of drainage channels					
3. Evidence of obstructed drainage					
4. Deterioration of monitoring point labels					
5. Deterioration of retention pond					
6. Sediment pond cleaning needed					

N/A Not applicable to site location

Pg. 1 of 1



#### **COMMUNITY OUTREACH PLAN**

#### Prepared for

# UNITED STATES ENVIRONMENTAL PROTECTION AGENCY and the TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

On behalf of



6565 N MacArthur Blvd, Suite 800 Irving, Texas 75039

Prepared by

#### WESTON SOLUTIONS, INC.

2705 Bee Cave Road, Suite 100 Austin, Texas 78746 512-651-7100 • Fax 512-651-7101

July 12, 2011

W.O. No. 14160.001.009.0002



### **TABLE OF CONTENTS**

Se	ction		Page
1.	INT	RODUCTION	1
2.	CM	C'S CORPUS CHRISTI FACILITY SITE DESCRIPTION	1
3.		MARY OF PROPOSED REMEDIATION ACTIVITIES AT CMC'S CO	
4.	CON	MMUNITY INVOLVEMENT ACTIVITIES	2
	4.1	PUBLIC NOTICE	
	4.2	PUBLIC COMMENT PERIOD	
	4.3	PUBLIC INFORMATION MEETINGS	3
	4.4	MEETING RESPONSE AND REMEDATION IMPLEMENTATION	

#### **LIST OF FIGURES**

Figure 1 CMC Corpus Christi Facility Location Map

Figure 2 CMC Corpus Christi Facility On-site Property Map

july 2011

#### 1. INTRODUCTION

Weston Solutions, Inc. (WESTON®), on behalf of the Commercial Metals Company (CMC), has developed this Community Outreach Plan (COP) as part of planning for public involvement in anticipated cleanup activities at CMC's Recycling facility in Corpus Christi, Texas. This COP is a planning tool for public involvement in the remediation process and is designed to foster an open channel of communication between CMC and the local community, the U.S. Environmental Protection Agency (EPA), and the Texas Commission on Environmental Quality (TCEQ) Voluntary Cleanup Program (VCP). Assisting area residents, interested groups, and local organizations in providing input into the cleanup process, this COP is structured to allow modifications in response to changing community needs.

#### 2. CMC'S CORPUS CHRISTI FACILITY SITE DESCRIPTION

CMC's facility is a 17.2-acre property located at 4614 Agnes Street, Corpus Christi, Nueces County, Texas. The property is bounded by Navigation Blvd and the City of Corpus Christi water storage facility to the west, various commercial/industrial businesses to the east, Texas-Mexican Railroad right-of-way (ROW) and Agnes St to the south, and a radio tower and undeveloped land to the north. A Property Location Map is provided as Figure 1.

CMC has recently purchased the formerly off-site property, known as the former Flato property, to the north and is in the last stages of acquiring the adjacent, undeveloped portion of Paxton Street right-of-way as part of the remediation. The acquisition will not change the remediation approach, but may affect volume of soils disposed off-site. Property location and boundary maps are provided as Figures 1 and 2.

## 3. SUMMARY OF PROPOSED REMEDIATION ACTIVITIES AT CMC'S CORPUS CHRISTI FACILITY

The proposed remediation approach includes the removal and off-site disposal of on-site soils with PCB concentrations greater than 500 mg/kg, removal and off-site disposal of off-site soils with PCB concentrations greater than 1 mg/kg, and placement of most of the affected on-site PCB soils under a fenced-in, clay cap. Future use of the non-capped portion of the facility is anticipated to be for receipt and transport of scrap metal material.

1 July 2011

The schedule for remediation activities is proposed below.

Activity	Anticipated Start Date
Approval of Application for Risk Based Cleanup by EPA	September 2011
Public Notice Period and Response/Changes (if necessary)	October - November 2011
Final Engineering Design and Bid Specifications	December 2011 – January 2012
Bid Selection	February 2012
Relocation	March – April 2012
Concrete Demolition Activities	May 2012
On-Site and Off-Site Soil Excavation and Confirmation Sampling	June – July 2012
Backfilling of Excavated Areas and Construction of Clay Cap	August 2012
Final Grades, Stormwater Retention Improvements, and Final Fencing	October 2012
Final Summary Report submitted to EPA and TCEQ	December 2012

#### 4. COMMUNITY INVOLVEMENT ACTIVITIES

CMC's Corpus Christi Facility will be prepared to address areas of community concern and public involvement through this COP in the following activities:

#### 4.1 PUBLIC NOTICE

Public notice of the proposed remediation at CMC's Corpus Christi Facility will be made known to the public in three ways:

- A newspaper display advertisement will be printed in a newspaper of general circulation in the community (The *Corpus Christi Caller-Times*). The display ad will be located in such a place as to give effective notice to the general public and sized to be easily readable. Notices will also be posted in Spanish.
- Notice of the proposed remediation will be provided on a clearly marked, visible, and accessible signs along each side of the CMC facility. The signs will be large enough to be read from the nearest point where the public would pass -- on foot or by vehicle -- by the site. The sign will use 1.5 inch font, be 18 inches high and 28 inches wide.
- Notice of the project will be broadcast at least once on local radio in English.

2 July 2011

#### 4.2 PUBLIC COMMENT PERIOD

The day the posting of public notice is printed in the newspaper as described above, a public comment period of 45 calendar days will begin in order to allow members of the community and concerned organizations to communicate questions and concerns regarding the proposed remediation activities. Contact information for those submitting questions and comments will be recorded so that interested parties can be notified for future public information meetings and additional issuances of information.

#### 4.3 PUBLIC INFORMATION MEETINGS

After the public comment period, if significant community interest is generated and a public meeting is requested during the public comment period, CMC's Corpus Christi Facility will conduct a public meeting. Representatives of CMC will be in attendance, and representatives of EPA and TCEQ will be invited. CMC will announce the time and place of the meeting in The *Corpus Christi Caller-Times*, and through the mailing list that will be constructed during the public comment period.

#### 4.4 MEETING RESPONSE AND REMEDATION IMPLEMENTATION

After completion of the public meeting, if conducted, CMC, EPA, and TCEQ will take into account comments provided by the public prior to implementation of planned remediation activities. After EPA approval of the Application for Risk Based Cleanup, the approval will be announced via display advertisement in the *Corpus Christi Caller-Times*.

3 July 2011

